MODERN FURNACE HEATING

(HESS)

Modern Furnace Heating

For Dwellings, Churches Stores, Etc.

A Description of the Hess **Welded Steel** Pipe Furnaces, Pipeless Furnaces and Circulating Room Heaters

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A HANDBOOK ON FURNACE HEATING

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Branches in:
Brooklyn, N. Y. Cincinnati, Ohio Detroit, Mich.
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MODERN FURNACE HEATING

A TREATISE ON FURNACE HEATING

Which May Be Applied Successfuly To Any Furnace

Just as important as the selection of the furnace, is to know the furnace and equipment will be properly planned for its heating requirements. The best furnace on earth will not give good results if installed after an improper heating plan. The size of furnace and location in basement; sizes and locations of all pipes and registers, of cold air faces and ducts, and other details are very important. Furnaces too small are frequently installed with improper connections, resulting in poor heating. Any equipment to have our heating guarantee must be planned properly and check with the best known guide for heating work. The "Standard Code" issued by the National Warm Air Heating and Ventilating Association, is recognized as the best guide and authority for the planning of furnace installations and should be carefully observed.

For the heating of dwellings, Churches, stores, Schools, etc., excepting those of large size, there is much to commend the use of good furnaces in preference to stoves, steam or hot water.

As compared with stoves, the furnace offers every advantage. It saves space in the rooms, is more economical in the matter of fuel and labor, and infinitely cleaner, for all coal and ashes are handled in the cellar and the distribution of dirt through the rooms is avoided. The distribution of heat, by means of the circulation of warm air, is far more effective. All parts of all the rooms are flooded with warmth, and the cold air, lying at the floor, is removed, an impossibility with stoves, which heat by direct radiation only.

With steam or hot water the temperature obtainable is confined to a very limited range. With steam a high temperature only can be had, which is often oppressive in mild weather and wasteful of fuel. With hot water a low heat from little fire is possible, but it is impracticable to force the heat beyond a certain point, though this may be very necessary in severe weather. With either system, accidental leakage from pipes or radiators may entail enough damage to pay for the entire equipment. Explosions with disastrous effects have occurred occasionally with steam and hot water systems. The painted iron radiators are unsightly, uncleanly, and occupy wall space which might well be used for some better purpose. With steam and hot water the air is not circulated as rapidly as with the hot air furnace nor is the heat as evenly distributed, the radiation of heat being the same as with stoves, but slower, because of the lower temperature of the radiating surfaces. There is no provision for the removal of the lower strata of cold air at the floor, as with the furnace method, hence there is always a considerable difference in the temperature between the floor level and the upper levels of the rooms.

A good furnace is more economical of fuel than either steam or hot water, and diffuses heat immediately upon lighting the fire. This heat may be increased or diminished at will, to any extent, by a very simple method of regulation. It provides ventilation and thorough circulation of heat, and, from a sanitary point of view, is to be pre-

ferred. It is adapted to all classes of buildings excepting those of largest size, and is much easier and quicker to install than steam or hot water. The space required for unsightly steam pipes and radiators is saved. Any ordinary mechanic or any handy man, even though not a mechanic, can install and repair a furnace.

A water supply is not needed and leakage is, therefore, impossible. The management is simple, and a furnace is as easily understood as an ordinary stove.

The cost of the different methods of heating should be considered. Why pay a large amount to install a hot water or steam plant in your house, when a furnace equipment can be secured at a fraction of the cost, operated at less expense, with less expense for repairs and which, if properly installed and operated, will give more satisfactory results, than either steam or hot water?

We find, occasionally, a prejudice against furnace heating, and an impression that thorough heating cannot be accomplished with this method, but the reason for this prejudice can always be traced to failures due to ignorance or carelessness on the part of some one not qualified to plan a heating system by this method. Successful furnace heating depends entirely upon proper arrangement of all parts of the heating equipment—proper size and location of the heater; proper sizes and locations of pipes and registers; proper size and position of air supply (very important), and these details must be carefully and intelligently planned or the full capabilities of the furnace method will not be realized.

When possible, an expert should plan the arrangement of the heating plant, and this service should preferably be given by the makers of the heater to be used, who will assume responsibility for its success.

We have undertaken to outline, in this booklet, in simple language, the principles and methods involved in furnace heating, so the novice and user of furnaces may understand their application to his own needs. With an understanding of these principles, and a fair degree of intelligence and care in operation of his furnace, the purchaser is assured of a comfortable and healthful atmosphere in his home, and an economical expenditure of fuel, with any make of furnace.

In the first place, a furnace must be regarded as a huge stove, with fire-box, smoke pipe and ash box arrangement like other stoves, and in which the fire is built and regulated just as in other stoves. But there is this radical difference—a stove radiates and circulates heat in the room in which it stands, while the furnace must produce heat at a point away from the rooms to be heated, and this heat must be confined and conducted to the place desired.

To accumulate and confine the heat generated, an enclosure, or heat chamber, about the furnace is necessary. This enclosure is provided by the galvanized casing of the furnace.

The conducting of the heat is accomplished by the use of a pipe or pipes, opening from the top of the heat chamber, or casing, and extending to the rooms to be heated.

But the heat will not move without a medium to carry it, and this medium is simply common air. It is known to all that warm air is light and will rise above colder air. Applying this knowledge, we let a supply of air into the chamber, at the bottom of the furnace. As it gathers heat it rises till it reaches the conducting pipes at the top of the heat chamber, then flowing through these pipes, it enters the rooms where heat is desired. A constant flow of air is at once established, which absorbs and distributes the heat from the furnace as fast as it is generated.

It is apparent that if we attempt to pour warm air into a suite of rooms for an indefinite time, unless we arrange to let out as much air as we bring in, we shall fail, just as we would fail to pour water into a bottle already full. This, then, calls for an exhaust from the space heated, to leave room for the warm incoming body of air.

We have already called attention to the fact that warm air rises above cool air. This occurs in the heating chamber of the furnace, the hotter air rising to the top to enter the conducting pipes. It also occurs when this warm air enters the rooms. It goes straight to the ceiling and spreads horizontally at the ceiling. It will not mingle freely with the cooler air below it, but lies in a stratum in the upper part of the room. A part of our problem then, is to get rid of the cool air at the floor, thus causing the warm air to descend and fill the lower portions of the rooms.

This suggests an opening at the floor, through which the cool air may escape, and, as we need a constant supply of air at the furnace to remove its heat, we make use of this air from the rooms as an air supply for the furnace, by conducting it back to the heater. Thus we make of the plant a complete circulating system, by which the cool air at the floor of the rooms is drawn to the furnace, heated and then returned to the rooms.

This is known as the **return-air or gravity system,** and when properly planned and installed, with the right kind of a furnace, it is healthful, efficient, and an economical system of heating.

The process is continuous, automatic and entirely successful.

It is applied by three methods: the "PIPE" furnace method, with separate pipes and registers for each room, the "PIPELESS", using one large register for both hot and cold air, and eliminating all horizontal pipes and ducts, and the ONE-PIPE method with one large heat register, and the return air brought through a separate duct.

THE PIPE FURNACE

is the older and better known, and is available for all classes of houses, churches, schools, etc. It fits the return-air or gravity scheme of heating by circulation, and is supplied with the cold or return air from the rooms above by one air duct or more.

It is not necessary, in an ordinary dwelling, that separate outlets for cold air be provided in each room. One or two large openings in the lower hall or living room is generally sufficient, for the communication between the various rooms is usually such that complete circulation is secured. We prefer one or two large air supply ducts

rather than a series of smaller ones, for several reasons. There is friction in moving air through ducts, just as truly as if we were moving water or sand or any other body. It is evident, therefore, that the larger the duct and the shorter the distance, the less friction there will be, and as a consequence the air will move in greater volume and more rapidly. Where there are numerous ducts leading to the heater the air will flow through those which offer the least resistance, viz., the shorter ones, and there will be an uncertain flow of air from the longer ones. Sometimes, with several ducts, the air from one room will pass through the ducts into another room, without going to the furnace at all, and the operation is most irregular and uncertain.

In any event the friction is so increased by the contraction and lengthening of the air supply ducts that their efficiency is very much impaired; therefore we plan, usually, one large direct duct, sometimes two, and we guarantee absolutely satisfactory results when our plan is followed.

It is sometimes desired that fresh air from out-of-doors be used. In this case the air supply is drawn through an air duct opening to the outer air, and outlets for the waste air of the rooms are supplied by way of fireplaces or other ventilating flues. The fresh air supply, to give best results, must open on the side toward the prevailing winds. In the vicinity of Chicago this would be toward the west.

While the use of a fresh air supply may be desirable, it is quite unreliable because of shifting winds, and we therefore advise that a return air, or inside supply, be used also, with such an arrangement of slides and valves in each supply duct, that when the fresh air supply is used the return air supply may be shut off, and vice versa. Both will not operate successfully at the same time.

The air supply ducts may be made of matched flooring or of galvanized metal. Wood is often preferred because of its lower cost, and as it is suitable in all respects, we recommend it in most cases. The spaces between joists may be utilized as air supply ducts, where their situation is right, thus reducing the cost of the ducts required.

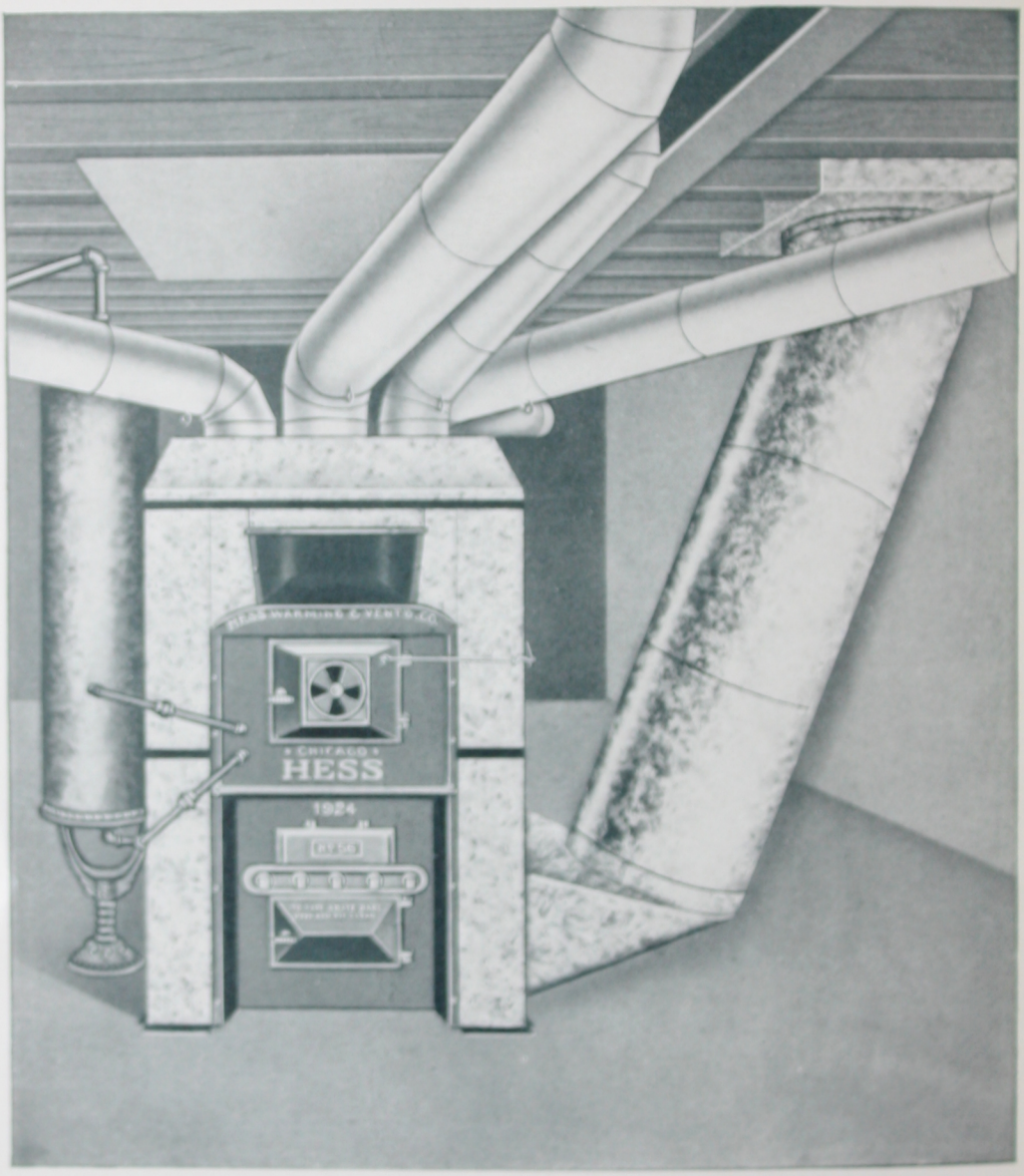
ELECTRIC FANS

In recent years we have occasionally made use of electric fans placed in the air ducts, to increase the flow of air through our furnaces, especially in large buildings such as churches, schools and theatres.

Fans are also very desirable when there are a considerable number of pipes on one furnace—for they insure the filling of all pipes with warm air. Fans for this purpose are inexpensive and require little current, and by their use air can be forced through long hot air pipes which might not be efficient under usual conditions.

HOT-AIR CONDUCTORS

It should be borne in mind, in planning for furnace heating, that air moves freely in straight lines, and that all crooks and turns retard its flow. And it must be remembered that the natural tendency of warm air is to rise vertically, and its velocity is diminished by an



A Hess Steel Pipe Furnace, showing pipes from top of cap—return air supply — hot water tank, etc.

attempt to carry it horizontally. Therefore, it should be a rule to plan so that all conducting pipes shall be as short and as straight as possible.

Our purpose is to get the heat away from the furnace quickly, for in this lies economy and efficiency.

It is a mistake to carry a hot air pipe across a room so the register may be under a window, if the room may be reached by a shorter pipe. The heat will go straight to the ceiling, no matter where the register may be, and the room will not be warm until it is full of warm air. Therefore, fill it with warm air the quickest way, and that way is with the short pipe. And the furnace should be placed in a central position with reference to the rooms to be heated, so the pipes may all be short and so they may all extend uniformly from different sides of the furnace, which is a distinct advantage. Needless to say, the warm air pipes should never pass beyond the outer cellar walls nor out of doors, where the cold air will chill them, and prevent the flow of warm air.

The height of the cellar where the furnace is to stand has much to do with success in heating. We have already noted that the tendency of heated air is to travel vertically. To this must be added, that the longer the **vertical** path of the heated air, the greater will be its velocity, and the consequent higher efficiency of the heater.

A high cellar, therefore, causes greater velocity in the movement of the heated air than a low one, hence better delivery of heat. Seven feet is a good height for a cellar. Eight feet is better, though not often provided. When a cellar is less than seven feet we recommend that a depression be made in the floor where the furnace is to stand, to gain the desired height.

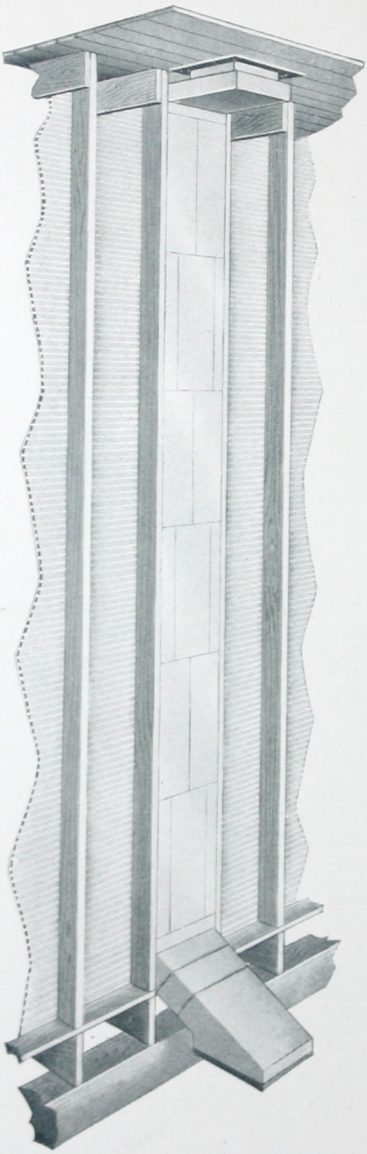
PARTITION PIPES

Pipes for upper rooms should be as large as the space in partitions will permit, and should be placed as near to the furnace as possible. The bottom ends should be provided with boots, or enlarged ends, so there may be no contraction in size where connected with the horizontal pipes extending from the furnace. Always have the boots put in, with round collars, when the stacks are placed in position, for it is sometimes difficult or impossible to make proper connections when the stacks are finished and plastered in, if boots are omitted.

If, in houses already erected, it is not desired, or seems impracticable, to place pipes for the second story in the plastered partitions, they may be placed in corners, closets, or passages. If made double, as they should be, they may be painted, papered over or boxed in, without danger of fire.

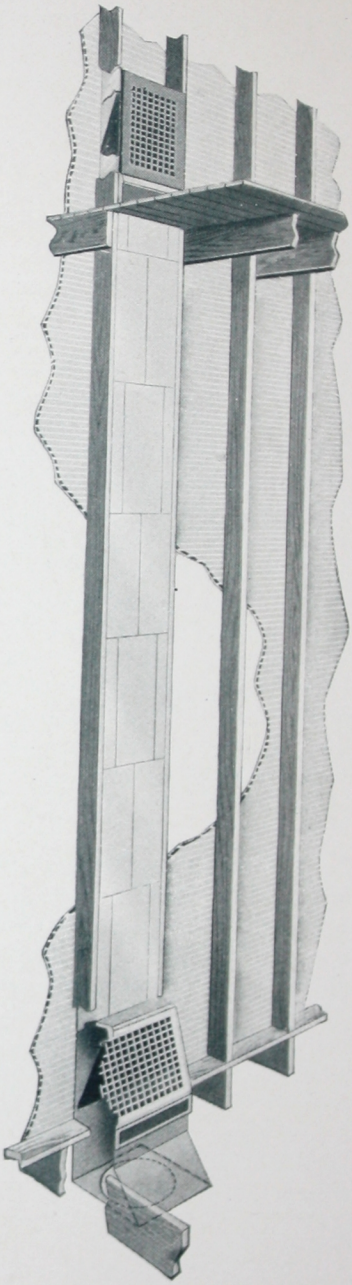
Wall pipes should never be placed in outside walls. The longer distance from the furnace, and the chill of the cold walls, will surely make trouble and render the heating through such pipes difficult and uncertain.

All partition pipes should be double, one inside of the other, with air spaces between, to insure safety from fire. With such pipes no covering is necessary.



Floor register and stack-elbow above.

No. 252 boot and No. 253 offset below.



"Wafer" register above.

Baseboard register below, and boot No. 208.

And here let us sound a warning against the use of single partition pipes, to be wrapped in asbestos paper, frequently supplied to save a few cents in cost. These are objected to by fire underwriters, and in Chicago and other large cities are prohibited by ordinance. Asbestos paper is thin and tender. It is often torn when put in, and is frequently nibbled and destroyed by mice, being of soft, fibrous character. It is, therefore, not to be relied upon as a permanent protection against fire, and where pipes are to be incased in wood, or are in wooden partitions, they should always be double, with air spaces for safety. No asbestos is required on such pipes.

All exposed conducting pipes should be protected from cold, for the contact of cold air checks the flow of warm air and robs it of heat. We consider it good practice to protect all cellar pipes, and all register boxes, which are invariably single, with asbestos paper, to prevent loss of heat. Pipes running through cold cellar rooms should have a double wrapping.

The pipes for the first floor rooms are usually round and of larger area than those for second floor rooms, the vertical length of the latter so adding to their efficiency that smaller sizes may be used.

We advise that each main room be provided with a separate pipe from the furnace, but it is often quite practicable to supply two or more minor rooms with heat from one pipe, such as dining room with bedroom or bath room adjoining.

We frequently recommend the use of a wall pipe for a first story room, with register, and extending to a second story room directly above, with another register at the higher level, thus economizing in the use of piping and in the cost of equipment. (See Page 8). While this will not always warm both rooms at once in cold weather, it will answer perfectly when heat is not required in both rooms at one time, as in the case of a living room with bedroom above it. By adjusting the register valve in the first floor room the heat may be directed into either room at will. Two upper rooms are frequently connected to one stack, with satisfactory results.

In many cases, where but slight warmth in upper rooms is desired, the use of pipes leading to such rooms may be dispensed with, and their cost avoided, by placing register openings in the ceilings of the warm lower rooms, through which heat will escape to the upper rooms, making them comfortable for sleeping purposes.

REGISTERS

Side-wall or floor registers may be used, and many styles and sizes are on the market. For first floor rooms we advise the use of floor registers, or "baseboard" registers, for the reason that the pipes leading to them may usually be of larger diameter than can be used for ordinary side-wall registers, and, as a rule, can be run with fewer bends.

For second story rooms use either floor or wall registers, depending on the situation of the wall pipe, that style being preferred which will afford the most direct outlet from the pipe.

THE HESS STEEL PIPELESS FURNACE

with hot-and-cold air register between two main rooms. Ceiling register to let heat into upper room, water coil for heating kitchen tank

THE PIPELESS FURNACE

method provides one large register only, to warm the entire suite of rooms. This register is placed directly above the furnace, and one-half of it only is used as a heat outlet. The other half of the register serves as a return or cold air supply for the furnace.

It is essential that the rooms to be heated by the pipeless method shall open into the main room, to be within range of the warm air circulation, and this indicates the limitations of the Pipeless method. A room detached and cut off from the main room is not affected by the furnace, and thus it occurs that a bath room or kitchen of the bungalow is not sufficiently warm. (We have designed an improvement applicable in such cases. See Page 33)

When the heated air leaves the register it rises straight to the ceiling and diffuses through all of the rooms which are open to the main room, where the register is installed. The warm air will penetrate to all corners of the rooms connected to this main room. If there is an open stairway, some heat will circulate to the upper hallway, and reach such rooms as may open into it. For more satisfactory heating of upper rooms, however, we recommend ceiling registers through which the heat will pass from the rooms below, keeping the rooms upstairs comfortable enough for sleeping purposes.

Meanwhile, as the heated air penetrates, colder air is displaced and, being heavier, descends and is constantly drawn back into the furnace through the return air inlet surrounding the hot air pipe.

In this way a rapid and constant circulation of air is maintained, insuring uniform temperature throughout.

At first glance it might be thought that the room in which the register was placed would receive too much heat, but with the return air system of circulating, this is not so. The warm air diffuses evenly and the temperature will be comfortable all over. Customers using the PIPELESS FURNACE have reported that the temperature through several rooms varies not more than 2 degrees at different points.

MORE ECONOMICAL THAN STOVES

One of the strongest points in favor of the PIPELESS FURNACE is its economy in fuel consumption. There is absolutely no waste in this system, as every unit of heat is delivered instantly, directly to the living rooms above. The loss of heat by radiation through the usual horizontal heating pipes in the basement is eliminated, and the waste heat in the cellar is reduced to a minimum on account of the insulation afforded by the cool air flowing down on all sides of the heater between the inner and outer casings.

The Pipeless method commends itself for old houses, because one register only is required, and some tearing up is avoided. Also for houses with small cellars, because of the omission of horizontal pipes and registers.

The PIPELESS method was adopted by us with some doubt and uncertainty, but after ten years of successful experience with it we unhesitatingly recommend it for a large class of bungalows, dwellings, stores, etc. Yet it must be remembered that it is not the best method

THE HESS STEEL PIPELESS FURNACE

Stores, churches and large rooms are perfectly heated by this method.
The heat is circulated, and is carried to every part of the room.

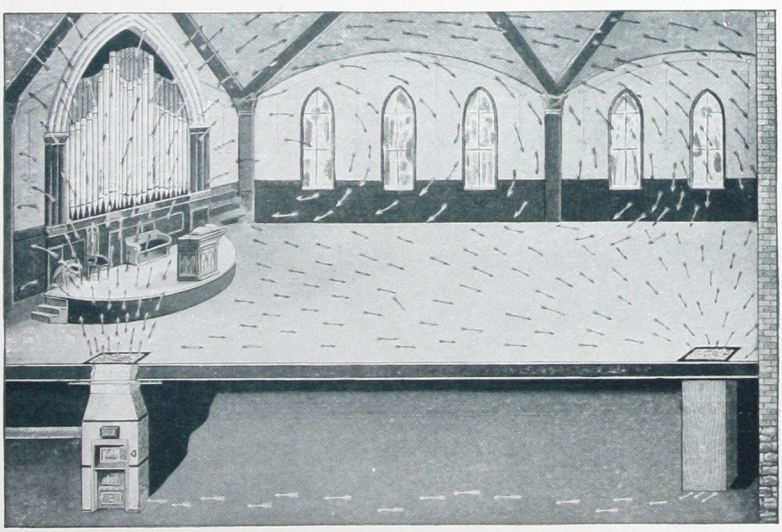
for every purpose, and advice should be sought before choosing it for two story houses and for dwellings where the rooms to be heated are not connected by liberal sized openings. The merits of the PIPELESS furnace have been over-rated by some over-enthusiastic advertisers, with resulting disappointment to the purchaser.

We do not regard the pipeless as a successor to the pipe furnace, but rather as a step in advance of the base burner.

The one-pipe method, sometimes also called pipeless, is shown below. In the case of a large room, such as a church or store, the cold air, instead of returning through the register next to the furnace, is drawn into the cellar, at points distant from the heat register. This increases the flow of warm air to the outer walls of the room and insures the complete and proper distribution of heat. Openings in the sides of the furnace near the floor, permit the entry of the return air into the furnace, thence to the room above through the single large heat register. Horizontal air supply ducts, with this method, are not required.

CHURCHES, STORES, AND OTHER LARGE ROOMS

The heating of a church, store or assembly room is readily accomplished with the one-pipe plan, and in such case, if there is one room only to be heated, there should be but one register face, directly above the furnace, with one or more return air faces at other points, to let the cold air at the floor back to the furnace.



A Church heated with the Hess Steel One-Pipe Furnace.
Horizontal air ducts not needed.

Do not use horizontal heat pipes in such rooms if it can be avoided. The one pipe plan gives better results, and when one register only is used, no damper nor valves should be used to shut off the heat. If it is necessary to reduce the heat, cool down the furnace, for if the heat is shut back on a hot furnace damage may result.

MODERN FURNACE HEATING

It is a mistake to place a furnace under a church room and then branch off with long pipes, running to registers in the different aisles. Distribute the heat from one large outlet, and there will be no difficulty in heating.

Do not assume that there will be too much heat near the register and not enough elsewhere. The heat goes to the ceiling, straight, and your room will only be warm when it is entirely filled with warm air. This you can accomplish with the single register plan better than any other. The rapid delivery of warm air into the room brings about its thorough heating in the least possible time. The distribution of heat is aided by the withdrawal of cold air from the floor level, making room for the warm air to descend and circulate.

If two or more rooms are to be heated, some horizontal piping will be necessary; but the furnace should be so placed that these pipes shall be as short and direct as possible.

We recommend, as an air supply for a church or store furnace, the use of one or more vertical return-air ducts, which will discharge the air into the cellar, near the floor, just below the air supply face. The furnace is provided with screened openings on the sides, for the entrance of air, and it will draw the air from the room or rooms above, by way of the vertical ducts, without the use of any horizontal duct, nor any connection between furnace and the air supply registers. This plan has been thoroughly tested by us, and has proved entirely successful. A considerable saving is effected in the cost, by omitting the horizontal air ducts.

With this plan it is necessary that the cellar walls be tight, so cold air will not draw into the cellar. If the furnace is in an enclosed inner room, a suitable opening must be made in the wall of that room, to permit the free flow of air from the air ducts to the furnace. While we recommend this method, without horizontal ducts, because of its economy, we in no way object to horizontal ducts, if they are preferred, or if open walls or other reasons exist which would make them advantageous. In such cases the ducts may extend along ceiling or floor, or beneath the floor, and the results will be entirely satisfactory.

To warm the lower room, where the furnace stands, if this is desired, an outlet in the top of the furnace is made, with a slide to open and close. The heat may be regulated at will, and the furnace may thus be used for upper or lower rooms, independently of each other, or both at one time.

Because of the fact that churches are often without heat during the week days, the walls and furniture will absorb much heat before the rooms become comfortably warm, and therefore, it is desirable to use extra large furnaces, which will permit the rapid heating of the rooms for Sunday use.

Care must be exercised in making the ceilings of church rooms tight. If crevices, ventilators or manhole openings exist, the heat will be rapidly lost, and the heating apparatus, of any kind, will be ineffective.

It is essential, too, that the space above the ceiling be tight and warm. If otherwise, much heat is absorbed by the ceiling and lost by radiating into the space above. If the attic or loft over the ceiling

has windows, ventilators or tower, keep them closed tight in winter. The free circulation of cold air in this space means loss of heat and waste of fuel.

If steel or wood ceilings are used, a paper lining should be placed back of them, for the joints are sure to open more or less, and permit the escape of the warm air.

If, after each service in a church, windows and doors are opened and the church is filled with fresh air, no other ventilation will be required, for the body of fresh air which the church contains will remain fresh through the ordinary service. If, however, it is thought that special provision for ventilation should be made, we refer to our paragraph on ventilation.

For small audience rooms the Pipeless Furnace is very efficient—but in large rooms we recommend the Pipe Furnace, with return air supply drawn from distant points: this plan providing more complete circulation of the heat.

SCHOOL ROOMS

Under the laws of practically all of the states, the admission of a definite amount of fresh air into the school room, is required. With furnace heating this is simply and certainly accomplished.

The furnace is provided with a large heat register directly above it, as shown on page 13 or, as some school authorities require, the heat may enter the room through a side wall register, to be placed seven feet above the floor, but the fresh air supply is brought from out-of-doors through a cellar window or opening in the wall.

The fresh air passes through the furnace, is warmed and delivered into the room. With this arrangement, a ventilating flue is necessary, and it should be ample, in capacity, to remove an amount of air equal to that entering through the furnace. The opening into the ventilating flue should be near the floor, so the coldest air of the room may be removed. The action of the ventilating flue is assisted by the warmth of the smoke flue, which may be adjoining or within it.

If there is no cellar under the school room a room heater of the type described in the paragraph following may be used. Such a heater may be placed in one corner of the room, next the smoke and ventilating flue.

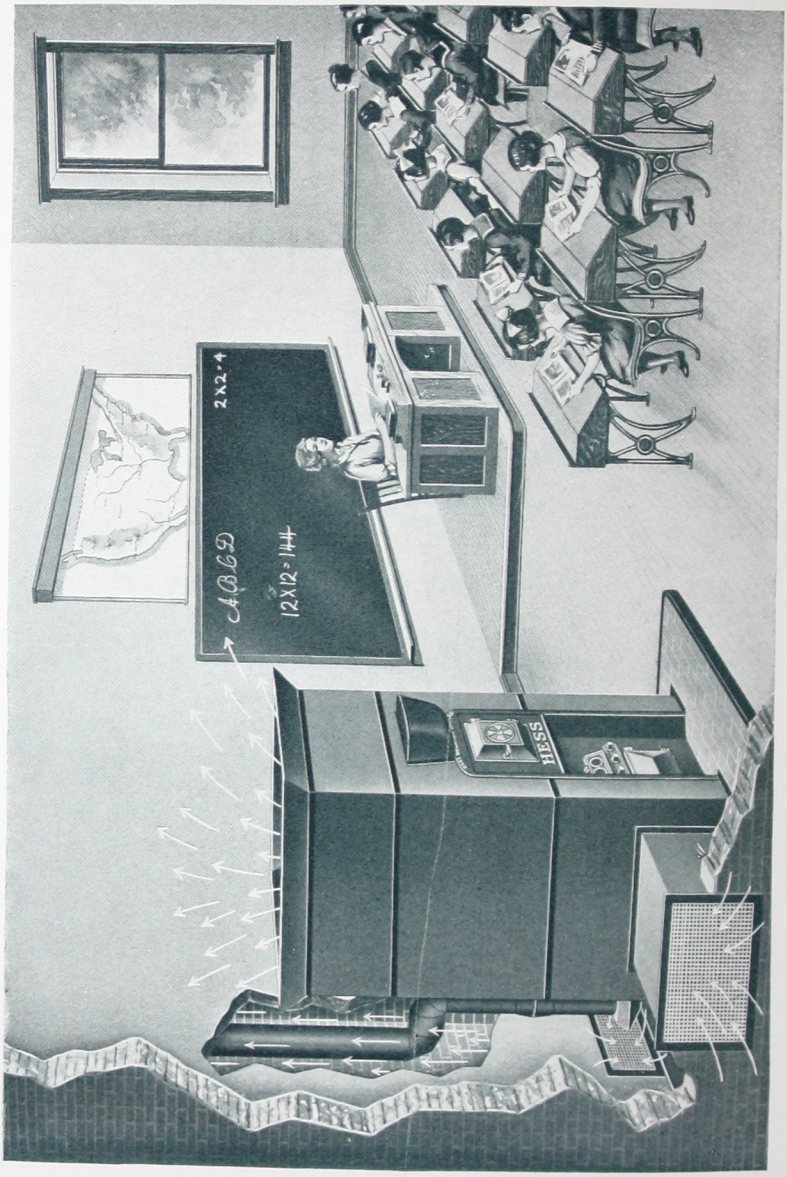
Fresh air is admitted to the heater through an opening in the wall, either above or below the floor.

Provision is made, with either type of school heater, for shutting off the outside cold air when school is not in session, and circulating the air of the room, thus maintaining the heat with small expenditure of fuel.

CIRCULATING ROOM HEATERS

It is frequently preferred, when a large room is to be heated, that a heater be used which shall stand within the room itself. If a heater of the "Circulating" type is used, it may be placed anywhere in the room, even in an extreme corner, and yet will circulate all the air and will warm every part of the room alike.

Such a heater should be so encased that little heat will radiate



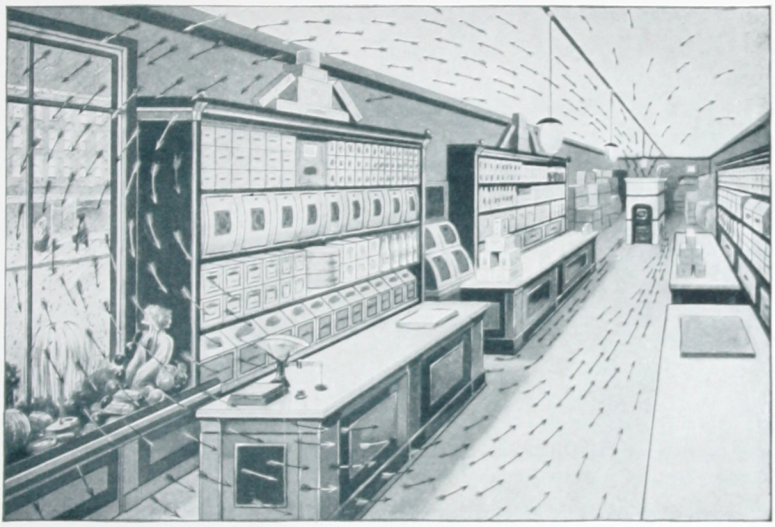
The Hess Circulating Room Heater. Black Steel Casing.

Inner construction similar to the Hess Pipe Furnace.

Heats and ventilates school rooms perfectly, admitting and distributing fresh warm air. The foul air escapes through a ventilator back of the heater, thence up the flue warmed by the smokepipe. This meets all state laws for school sanitation.

from the sides, the purpose being to draw the cold air from the floor and discharge it, properly warmed, from the top of the heater. (See cut Page 35.)

No registers, pipes, nor air ducts are required in this plan of heating. The heater should be ample in capacity to warm the room



A store heated with a Hess Steel Circulating Room Heater.
The currents of warm air keep show windows dry and free from frost.

in which it stands, as well as all rooms having open connection with it, for it heats uniformly, and if **all** the space connected is not heated, no part will be. The temperature throughout will be alike. Churches are warmed in this manner, the heater being placed in one corner and concealed by a curtain or screen.

If ventilation is required, a fresh air supply may be brought to the heater, entering at the side or beneath the floor. Outlets for refuse air may be provided, as outlined on Page 16.

THE CHIMNEY

We cannot be too emphatic in declaring that an imperfect chimney is the usual cause of trouble with heating apparatus of any kind, and that too much care cannot be bestowed upon the proper location and construction of this important adjunct to good heating.

For **success,** with any method, have a separate flue for the heater: let it be not less than 8x12 inches **inside,** and 12x12 if possible: make it **straight** from top to bottom, and have it **smooth** inside. A fire clay tile lining is worth all it costs.

Make no openings into this flue except for the furnace pipe, and for an iron cleanout door at the bottom and **keep that door closed.**

If you have another flue alongside, let there be a tight partition separating the two, from top to bottom.

Let the chimney extend well above the highest part of your roof, and do not put a cover or "top" upon it.

If there is a crook or bend in the flue, make sure no mortar or soot has lodged there. If a fireplace or kitchen stove connects with this flue, **close them tight,** when not in use, so cold air cannot draw in and spoil the furnace draft.

If the mortar in the joints exposed to the weather has washed out, repoint it and make it tight.

With a **good** flue, you can keep a good fire with the dampers **closed** and obtain all the heat the fuel contains. If your flue is so poor that you must keep the draft damper open, you are wasting heat (money) up chimney, and it is the loss and rush of heat which make it appear that your draft is good.

Our illustrations on Page 19 show ordinary defects in chimneys and faults of construction.

If you want good service and economy with any system have a good chimney first of all.

HUMIDITY

With any method of heating, it is highly desirable and important that the proper humidity or moisture of the atmosphere indoors be maintained. In the case of buildings warmed with stoves, or with steam or hot water, this can be accomplished only by open evaporating pans in each room, for, contrary to a popular belief, steam and hot water heating do not add moisture to the atmosphere. Steam and hot water are moist, to be sure, but this moisture is confined in radiators and cannot evaporate through solid iron, and the atmosphere is not moistened by radiators or pipes.

With a furnace, the moisture is conveniently and evenly supplied from an open water-pan placed within the air chamber of the furnace, the evaporating moisture mingling with the warm air as it passes to the rooms.

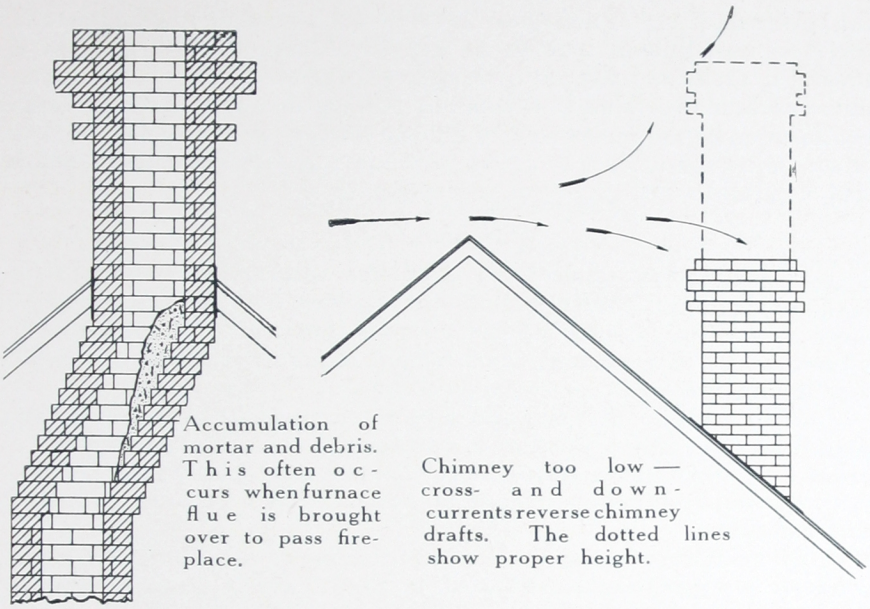
Few realize the importance, the purpose, or the effect of the addition of moisture to the air.

Air at 15 degrees, when saturated, containing all the moisture it will carry, can hold but one-sixth as much as it will carry if warmed to 70 degrees. If, therefore, we warm it without adding moisture, the air becomes exceedingly dry and "thirsty." It will draw the moisture from any object exposed to it. Plants will languish, woodwork will shrink.

The effect on the human system is unpleasant, noticed frequently in dry and parched skin. The mucus membranes and eyes are especially affected by the excessive dryness, and headaches from this cause are not uncommon. Dr. W. A. Evans, formerly chief of the Board of Health, of the City of Chicago, voices the opinion of the medical profession, when he says:

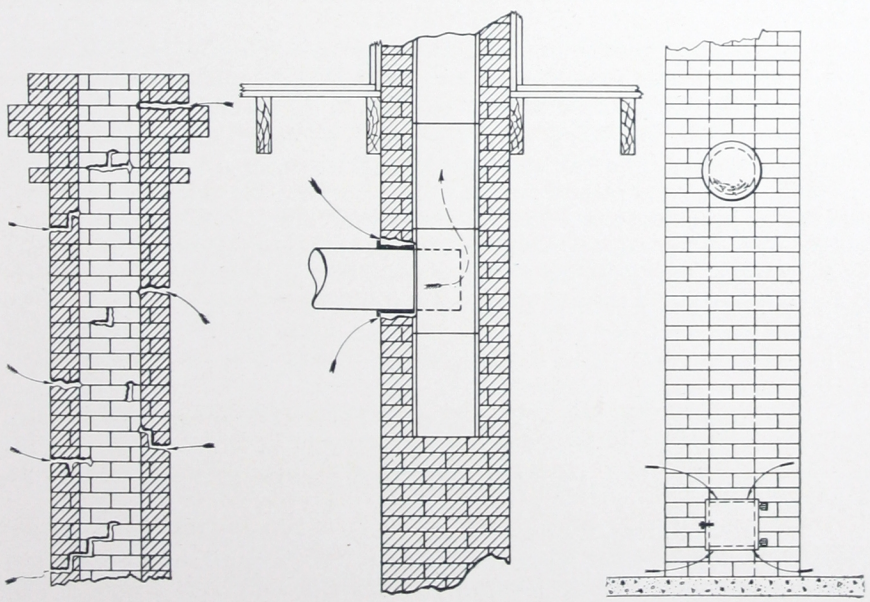
"Whenever you add heat to air you must add water to it in proper proportions. If you do not, there will be trouble. Hot, dry air will take water wherever it finds it—it will take water out of wood; the furniture falls to pieces and doors creak. It will take water out of the nose, throat, and bronchial tubes. Infection results."

Not only is the atmosphere rendered more pleasant and health-



Accumulation of mortar and debris. This often occurs when furnace flue is brought over to pass fireplace.

Chimney too low — cross- and down-currents reverse chimney drafts. The dotted lines show proper height.



Mortar fallen out of joints between bricks. The leakage of air reduces the draft.

Smoke pipe pushed too far into flue, closes the opening for smoke.

Open cracks around clean out door. Flue stop rusted through and leaky.

Faulty Chimneys—the cause of trouble with any heating system.

ful by the addition of moisture, but a decided economy in fuel results, for it is well known that to be comfortable in a dry atmosphere, several degrees of temperature higher are required than if the atmosphere is humid. This is accounted for by the fact that the rapid evaporation of the moisture of the body, in very dry air, has a cooling effect, not experienced in an atmosphere more moist, and in which such evaporation is, therefore, less rapid.

VENTILATION

In the heating of ordinary dwellings where the family has the range of numerous rooms, and where windows and doors are opened more or less, occupancy of the house is not such as will seriously vitiate the air to an extent which would require special provision for ventilation.

With a proper furnace and a return air supply such as we have described, the ordinary home is comfortable and the atmosphere is healthful. In churches and schools, theatres and assembly halls, however, where many people congregate, ventilation is essential to health and comfort.

By ventilation we mean the introduction of a body of fresh air, properly warmed, and distributed in such manner as to constantly dilute and improve the body of air already in the room. There can be no separation of the bad from the good air, for they mingle instantly. Ventilation, therefore, is a system of dilution and diffusion of fresh air.

The proper ventilation of a building involves the need of more power in the heater and the consumption of more fuel than would be used without ventilation and with the return air system.

The heater is placed in the manner we have described for the return air system, and the same pipes and registers are used, but fresh air from out-of-doors is brought to the furnace through an air duct, and when properly heated is delivered into the rooms. Besides providing a fresh air supply we must also provide outlets from the rooms to be heated, for a volume of air equal to that brought in must be removed. For the reason that the coldest and least valuable air in the room lies next the floor, outlet openings are placed near the floor or in the floor, and these connect with vertical flues or ducts leading to the outer air.

In a new building it is best to plan flues leading upward through the roof, and if these flues are built along side of smoke or heat flues the warmth imparted to them will greatly increase the flow of the waste air upward.

In old buildings where it is impracticable to build air flues, we frequently throw light partitions across the corners of the rooms, forming triangular ducts, leading up into the attic space above. In this attic space we provide galvanized pipes connecting with a ventilator cap, extending through the roof.

This method is economical and effectual and is used in very many buildings throughout the United States. If electric fans are used in this connection, the size of the flues may be reduced because of the additional power provided for moving the air.

MODERN FURNACE HEATING

In planning a ventilating system we do not omit the return air provision, for when the building is not in use the fresh air ducts may be closed, and the building may be heated with the return air system at much less expense for fuel. With this arrangement the fresh air should not be brought in except when the assemblage is present and fresh air is necessary.

TO SELECT A FURNACE

In the selection of a furnace care should be taken to secure one amply large. "Just large enough" is too small. Get one big enough to warm your rooms, without crowding, in the coldest weather, and you will have a maximum of comfort at a minimum of expense and labor. A forced fire wastes fuel; a large furnace is more economical of fuel than a small one and entails less expense for repairs, and requires less attention.

The main points to be observed, therefore, in planning the heating of your house, are:

1. Buy a furnace amply large.
2. Connect it to a good chimney.
3. Place it in a central location.
4. Have the pipes short, straight and of ample size.
5. Let your air supply be efficient.
6. Let us assist you, as follows:
   Send us a sketch of your house and we will indicate, in a plan we will send you, where to put the furnace, the size and location of the proper air supply duct, heat registers and pipes. This service is absolutely free: no charge, and no obligation on your part.

IN GENERAL

The rules and suggestions laid down in the preceding pages may be successfully carried out with any good furnace. It is necessary, however, in order to accomplish the best results with the least expense and labor, to combine in the furnace to be selected a few essentials of construction, as follows:

Capacious and convenient fire-box.

Permanent joints which can never open and leak.

Efficient radiating surfaces; meaning not only large area, but of thin metal, which radiates rapidly, rather than heavy, thick bodies of metal which transmit their heat slowly.

SHEET STEEL IS THE IDEAL MATERIAL FOR A RADIATING MEDIUM.

Simplicity of construction, which means absence of complicated parts, or flues to clog and leak, and no machinery to get out of order.

Freedom from repairs. The simple furnace is the cheapest to maintain from year to year, and if built right can be repaired by any handy man at slight expense.

Such a furnace is

THE HESS WELDED STEEL FURNACE

MODERN FURNACE HEATING

WHAT IS THE IDEAL HEATER?

THE IDEAL HEATING plant should give ample heat, even heat, clean heat, moist heat, healthful heat, quick heat, easily regulated heat, and should be economical, in fuel and in attention required. It should last many years with little cost for upkeep, replacement of parts, etc. It should be adaptable to, and efficient with, any fuel.

With these points in view, we invite you to consider the HESS WELDED STEEL FURNACE, comparing it with stoves, steam heat, hot water heat, and with the ordinary type of hot air furnaces, these comprising all the methods available for the warming of buildings.

HESS FURNACES ARE NOT ORDINARY FURNACES

A Hess furnace is radically different from the ordinary furnace, in construction, in appearance, and in the advantages it offers. We have made furnaces, good ones, for fifty-one years. In 1898 we designed the present Hess Welded Steel Furnace and now, after numerous changes and improvements, we devote all our facilities to making this one style.

In the ordinary furnace, cast iron sections, or a combination of cast iron sections and steel sections, usually make up the ashpit, firebox and heating surface. These sections may be partially united with bolts, but generally the heavy rough castings are simply laid together, with grooves (so called "cup joints")—where they join, and in these grooves cement or sand is placed. When such furnaces are heated there is considerable expansion of the metal and, in the case of steel joined with cast iron, the two metals do not expand alike. The cement will not expand and contract evenly with either metal, and consequently it breaks away, leaving cracks and leaks. In the course of time the castings become warped and out of shape and other leaky cracks result. Ordinary furnaces, sectional furnaces, are generally conceded to be dirty and dusty and the escape of gas, dust and smoke is expected. We made them for twenty-six years, till 1900, and **we know.**

HESS FURNACES ARE DIFFERENT

The Hess Welded Steel furnace is not a sectional furnace. We have departed entirely from the older and common forms of construction and our furnace is away out of the dusty and dirty class. There are no cemented nor bolted seams to become leaky. We have done away with the use of cast iron for radiating surfaces and we make the entire inner body, or radiator, of heavy annealed steel sheets. This radiator is not of the usual round shape, but, for the best of reasons, is square and boxlike.

We have perfected a system for welding these plates together, and we use this process in addition to the usual method of riveting.

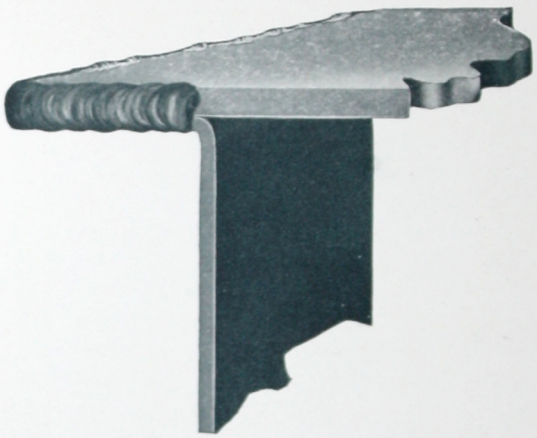
In this process the steel plates are clamped strongly together and riveted at intervals. Intense heat, with an acetylene-oxygen blow pipe, and an electric arc is then applied where the plates meet, melt-

The Hess Steel Furnace. Nos. 41, 46, 51 and 56 with high cap, water coil and air stub for metal air supply.
The air stub may be on the other side, or the air may enter by way of a pit under the Furnace.

ing the steel like wax, till the plates are fused together and become a continuous body of metal.

The welds are strong and clean, and, of course, absolutely and permanently proof against leakage. The firebox and ashpit are inside of the welded radiator, and gas and dust can never escape. The heating of the furnace, with its expansion and contraction, can never open the joints.

Such permanently tight construction is impossible in the ordinary sectional cast iron or semi-steel furnace, for the welding of cast iron or cast iron and steel is impracticable and there are usually only the bolted or cemented or sanded joints, which cannot be permanently

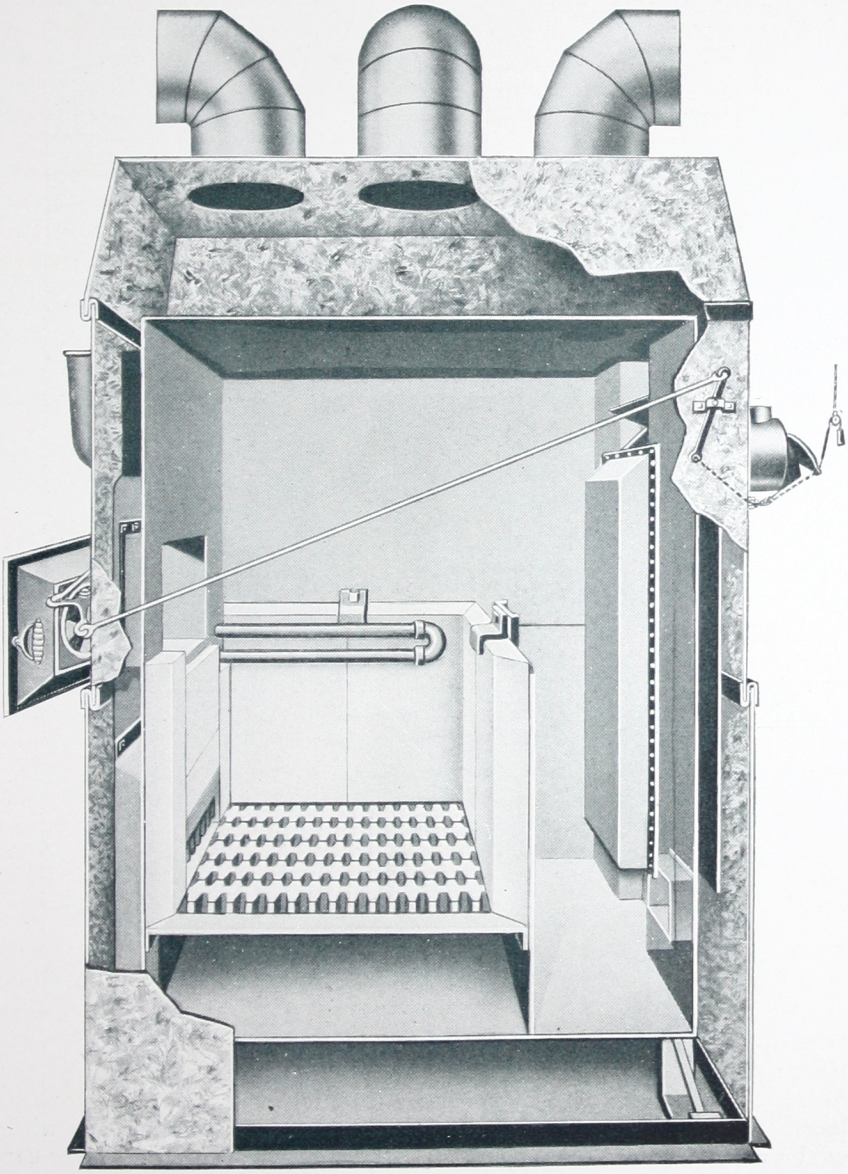


THE DETAIL OF THE RIVETED AND WELDED SEAM.

tight. With the Hess inner body or radiator the natural expansion and contraction from heat and cold, common to any metal, are taken up by the flexibility of the large flat area of the sides, and are not sufficient to strain the seams, a slight buckling of the sheets being the only effect, not in the least detrimental. WE GUARANTEE OUR RADIATORS ABSOLUTELY AGAINST LEAKAGE FROM THE WELDED SEAMS AS LONG AS THEY SHALL BE IN USE. There never has been a similar guarantee on any sectional furnace. A tight furnace will give clean heat with any fuel, and, because it has a PERMANENTLY tight inner body, the Hess furnace will ALWAYS give clean heat, even with smoky soft coal.

Another reason for using sheet steel is that this steel radiates heat faster than thicker cast iron and is therefore, more economical in the use of fuel. The heat is instantly transmitted and can be regulated quickly, which is not true with furnaces of thicker metal. A newspaper burned in a Hess furnace will create a perceptible warmth, which would not be felt with an ordinary furnace.

The sheet steel in our radiators is No. 12 gauge, about one eighth of an inch in thickness, four gauges heavier than we used prior to 1912.



Side view of the latest model HESS WELDED STEEL FURNACE, showing the new style of smoke outlet, check draft, clean-out door, and connecting rod from direct and check dampers to front door.

At first thought, this material may seem too thin for durability. Such has not proved to be the case. The average life of our furnace compares favorably with that of cast iron.

The steel is thoroughly protected against burning out. It will rust in the course of time, but if care is taken every spring to clean out the furnace properly, shutting up everything tightly, it will withstand rust for many years.

A bushel of fresh lime, in the fire-box, during the summer months, will help matters, by absorbing moisture and keeping the inside of the heater dry.

The use of steel in its flat form has a good deal to do with its resistance to rust. Steel rolled into tubes or round radiators will rust faster than if left flat, as in the Hess furnace, for the following reason: when steel is treated in the process of making sheets there is formed upon the surface a scale, or oxide; black, hard, brittle and not attacked by acid or rust. If the sheets are formed into tubes or round shapes, this oxide cracks and flakes off, leaving the clean steel exposed, and this rusts readily. As the plates in Hess furnaces remain flat, the scale is left intact and the rust-proof coating protects the metal, and adds to its durability.

The expense of maintenance of our heater, from year to year, compares favorably with the cost of maintaining cast iron furnaces, while we take credit, through the years, for a constant saving in fuel.

The square form of our furnace is economical in the use of material, and of labor, etc., and, at the same time, the radiating surfaces are greater in area than in a round furnace of the same diameter.

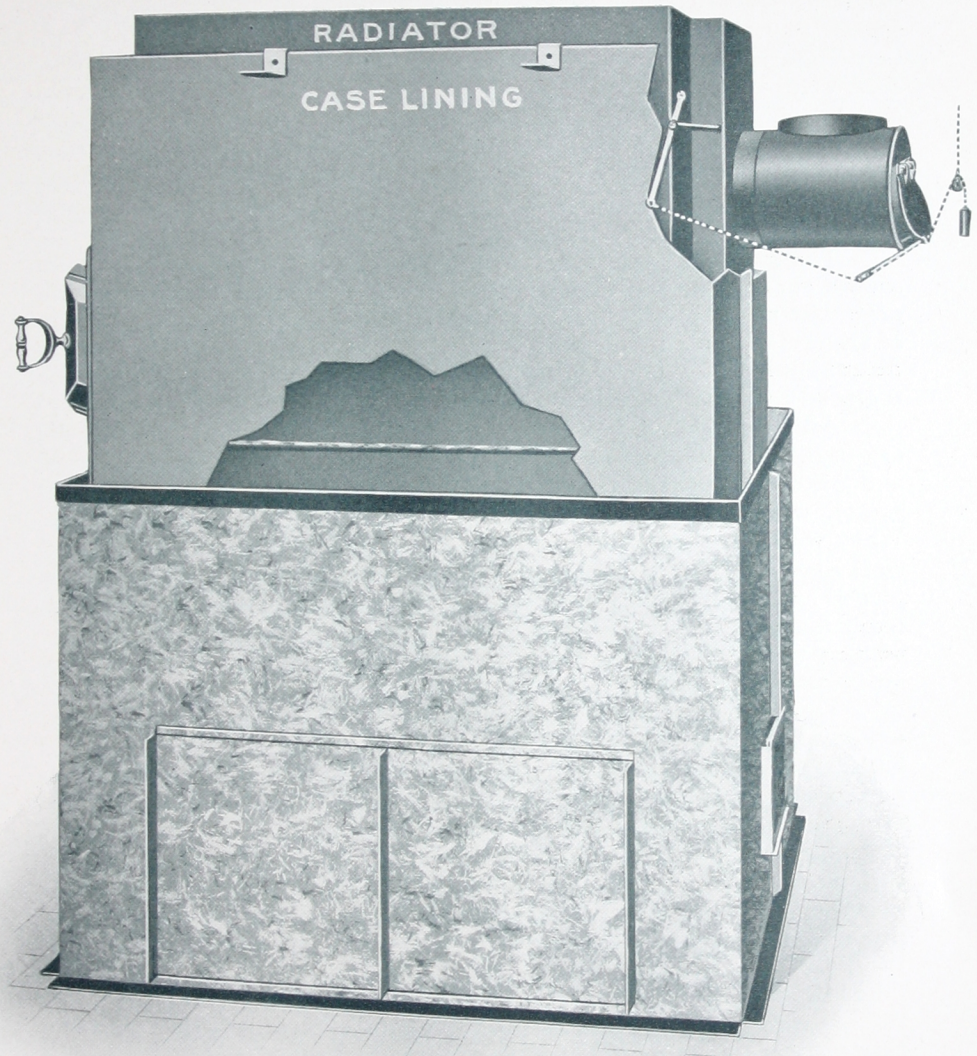
The water pan in the HESS furnace is efficient and of much value in the home. An automatic feeder is supplied, at slight additional cost, which keeps the water pan full.

The welded steel radiator is shipped complete, and will pass through an ordinary doorway. The other parts are sent "knocked down" and are easily handled. The whole heater, so simple in its construction, is made with carefully fitted parts, all holes ready for the bolts, and can be put together by any handy man.

HESS FIRE-BOX AND GRATE ARRANGEMENT

The steel is thoroughly protected against burning by the heavy firebrick slabs which line the fire-box. These slabs, about 2½ inches thick, rest upon steel brackets and have clamps to hold them at the top, and mitered ends at the corners, to prevent their falling out of place. They will pass through the fire-door and drop into place without the use of tools. Cement or fire clay are not required. They can be placed in a few moments without disturbing any part of the furnace. These fire-brick are of the best obtainable quality and are similar to those used to line cupolas and blast furnaces, and other receptacles for melted iron and steel. Fire-brick will stand 10 times the heat that will melt cast iron and will, therefore, resist any heat produced in a furnace.

Rectangular fire-boxes are used in locomotives and in large power plants as the outcome of much experience and study in the



The Hess Steel Furnace. The inner-case lining, check draft, clean out, and lower section of galvanized casing.

combustion of fuel. We discarded the round style in 1898, after 24 years' use of it. Fire-brick is the best material for fire-boxes for the reason that, being a good nonconductor of heat, it retains the high temperature which is necessary for the complete combustion of gases, soot, etc. Fire-brick is superior for oil burners to any other material and developes the utmost heating capacity of that fuel. Cooler cast iron fire-boxes are not efficient in this particular and are responsible for much waste of gas, smoke and soot, all of which are combustible and of value and which, in the brick lined fire-box, are saved and utilized.

The grate consists of several parallel rocking grate bars, with square ends projecting through the front of the furnace, so that each grate bar may be agitated or turned completely over, independently of any other. This enables the user to clear any part of the fire without disturbing any other portion of it. The grates are readily removed or replaced by unbolting the retaining plate on the furnace front.

All kinds of fuel found in different sections of the United States are used with complete success and economy. Hard and soft coal and coke are burned on the regular coal grates. We supply special grates, with fine mesh openings, for lignite and for soft coal slack. When wood is to be used we supply the regular coal grates and also a steel plate which may be passed through the fire-door. This plate is placed upon the grates and instantly adapts the furnace for wood, corncobs, etc., by permitting a body of ashes to be retained, thus preventing the inflow of too much air, and with these fuels fire will keep nicely for ten or fifteen hours, maintaining a steady heat.

The convenience of this arrangement is especially appreciated when it is desired to change from one fuel to another, for no time nor labor is expended in making the change. A suitable burner for natural or manufactured gas will be supplied, instead of grates, if desired, at slight additional expense.

As the fire-box and grates are close up to the front the work of caring for the fire is easily and conveniently performed. The arrangement is a great improvement over the usual situation of the fire-box in the center, as in other furnaces, where it is out of reach and difficult to clear. The fire-box is of large area, with the grate surface under the entire fire. For this reason combustion is perfect and clinkers are rarely formed. There are no corners filled with dead ashes, as is the case with square fire-boxes having round grates, for our grates clear the corners perfectly. Every part of the fire is bright and clean and will always do full duty.

Any of the numerous oil burners on the market can be used with the greatest efficiency. The welded, permanently tight construction of our furnace will allow none of the odor, fumes, or smoke to escape and enter the rooms. The large area of our radiating surfaces and the quick action of the steel, in radiating the heat, prove especially economical with liquid fuel or gas.

To prevent loss of heat in the cellar, the Hess furnace has a DOUBLE casing, one within the other, making a double air chamber. The inner or false casing, or lining, of black steel, is so situated that a current of cool air passes between it and the outer galvanized steel

casing and conveys the heat to the rooms above, instead of radiating it into the cellar through the sides of the heater. This double air chamber speeds up the circulation of air through the furnace and prevents loss. It is better than a covering over the furnace, for a covering or housing of brick, asbestos or plaster, etc., merely absorbs heat without hastening its delivery.

Our two largest furnaces, Nos. 58 and 60, are now supplied with two immense air flues passing vertially through the radiator back of the fire-box. These increase the radiating surface considerably and the vertical position increases the velocity of the air passing through.

The efficiency of these huge heaters is materially increased.

HUMIDITY OR MOISTURE — A NECESSITY

Most furnaces give forth dry, scorched air, which is disagreeable, unhealthful and injurious to furniture, pianos, etc. Such water pans as they may have are invariably too small and are usually placed at the bottom of the furnace where the cool air, only, passes over, and evaporation is too slow to be of any benefit.

Dr. Evans, one time Chicago's health officer, remarks, concerning such water pans,

"The prevailing practice is to heat but not to humidify. The ordinary hot air heater has a dinky water pan near the floor line. It evaporates a pint, or a quart, or a gallon a day. To sell it for a humidifier is to obtain money under false pretenses."

Your water must be steaming hot to evaporate quickly. Therefore, the water pan must be near the top where it will heat quickly, so the water may steam away into the air on its way to the rooms. In the Hess furnace the water pan is placed just above the fire-door, where it heats quickly, and in ordinary winter weather will evaporate four to eight gallons of water daily. This amount is desirable to properly humidify the atmosphere, and its sanitary and economical value should not be overlooked. Moist heat will insure health and reduce fuel bills, with a Hess furnace.

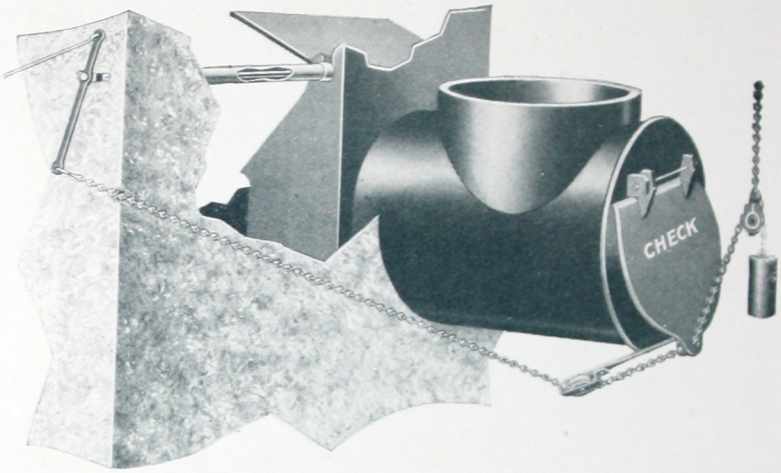
DRAFT REGULATION

The Hess furnace is regulated as easily as a simple stove, and responds instantly. Two chains are supplied for regulation from the upper floor, which may be installed where convenient. One attaches to the draft door in front, admitting air to the ashpit, to increase the fire. The other connects to a check damper behind, permitting the entrance of cold air into the smoke pipe, checking the draft to any required extent. These will control the heat without a trip to the cellar.

A separate arrangement gives complete control from the cellar. Here we have the ashpit door opened to increase the draft and a check wheel in the fire-door to reduce the heat.

A most convenient arrangement is a connecting rod, hooked to the fire-door and connecting with the direct draft damper, and also with a check draft in the smoke flue. This operates AUTOMA-

TICALLY, **WHENEVER THE FIRE-DOOR IS OPENED,** closing the check draft and opening the direct damper, putting the full power of the chimney on the fire and preventing the escape of smoke into the cellar while the fire-door is open. More simple and more efficient means of regulation cannot be imagined.



Check draft and direct draft dampers—operate automatically with opening and closing of the fire-door.

CLEAN OUTS

It would be impossible to make a furnace easier to clean than our furnace. The only place where soot can accumulate is in the settling chamber back of the fire-box. This is an open square space just like the ashpit, and by opening the clean-out door at the base of the smoke pipe, every particle of ashes, dust and soot may be removed quickly and easily.

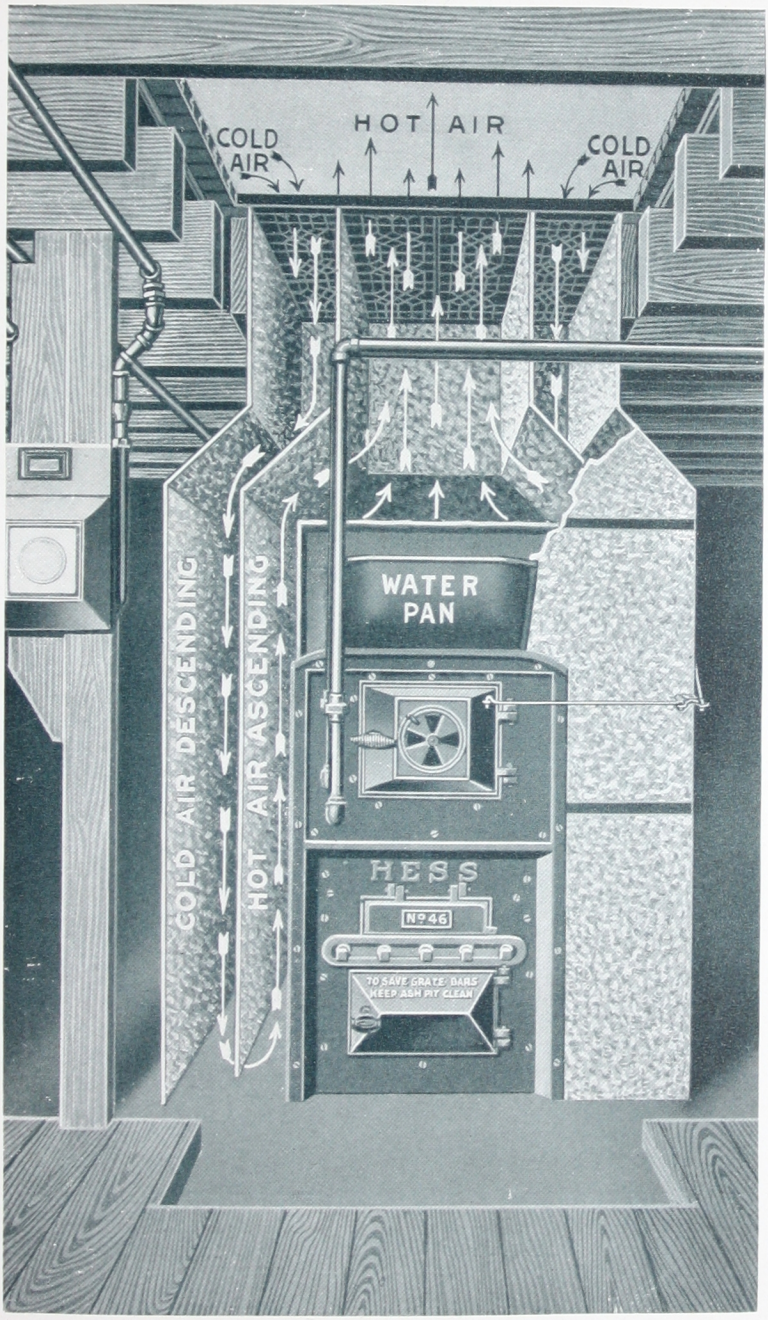
WATER HEATERS

A water coil for heating the kitchen tank is supplied, if desired, at an additional charge, and is a useful and economical accessory to the furnace.

We have also special water coils for heating hot water radiators from the furnace. These are useful for distant or much exposed rooms, which may be difficult to reach with the usual tin hot air pipes.

THE HESS PIPELESS FURNACE

The Hess Pipeless Furnace was introduced in the fall of 1915, as a new idea in heating bungalows and small houses, also single rooms, such as stores, churches, etc., without horizontal pipes, air ducts, registers, etc., and at a cost no greater than for a good base burner of equal capacity. In its interior arrangement of radiator, fire-box, grates, smoke outlets and doors it is exactly the same as the Hess Pipe furnace. The difference lies in the arrangement of the outer casings and of its connection with the heat and air supply register.



THE HESS STEEL PIPELESS FURNACE

(Front) showing hot air and return air spaces, water evaporating pan and hot water supply to kitchen tank. Note that the furnace is surrounded by a down-flowing body of cold air, thus preventing loss of heat in the cellar.

MODERN FURNACE HEATING

The furnace is set directly under a large register face or grating. This register is divided into two sections, a central heat outlet with a return air inlet entirely surrounding it.

All of the heat from the furnace is discharged upward through the central part of this register. The outer openings of the register are connected to outer return air spaces on the sides of the furnace. The inner casing, forming one side of the return air passageways, terminates about 8 inches from the cellar floor, the outer galvanized casing extends to the cellar floor, the space between the outer and inner casings being about 6 inches.

The cold air travels downward through the outer edges of the large register grating, inside the outer galvanized casings, then turns upward when it reaches the bottom of the inner casings. It is heated as it ascends next to the welded steel radiator, and is delivered into the room above, through the central opening of the register.

The desirability of producing the normal amount of humidity is not overlooked and the same efficient water pan arrangement is used as with the pipe furnace, to provide moist and healthful atmosphere in the rooms.

TO HEAT A DETACHED ROOM

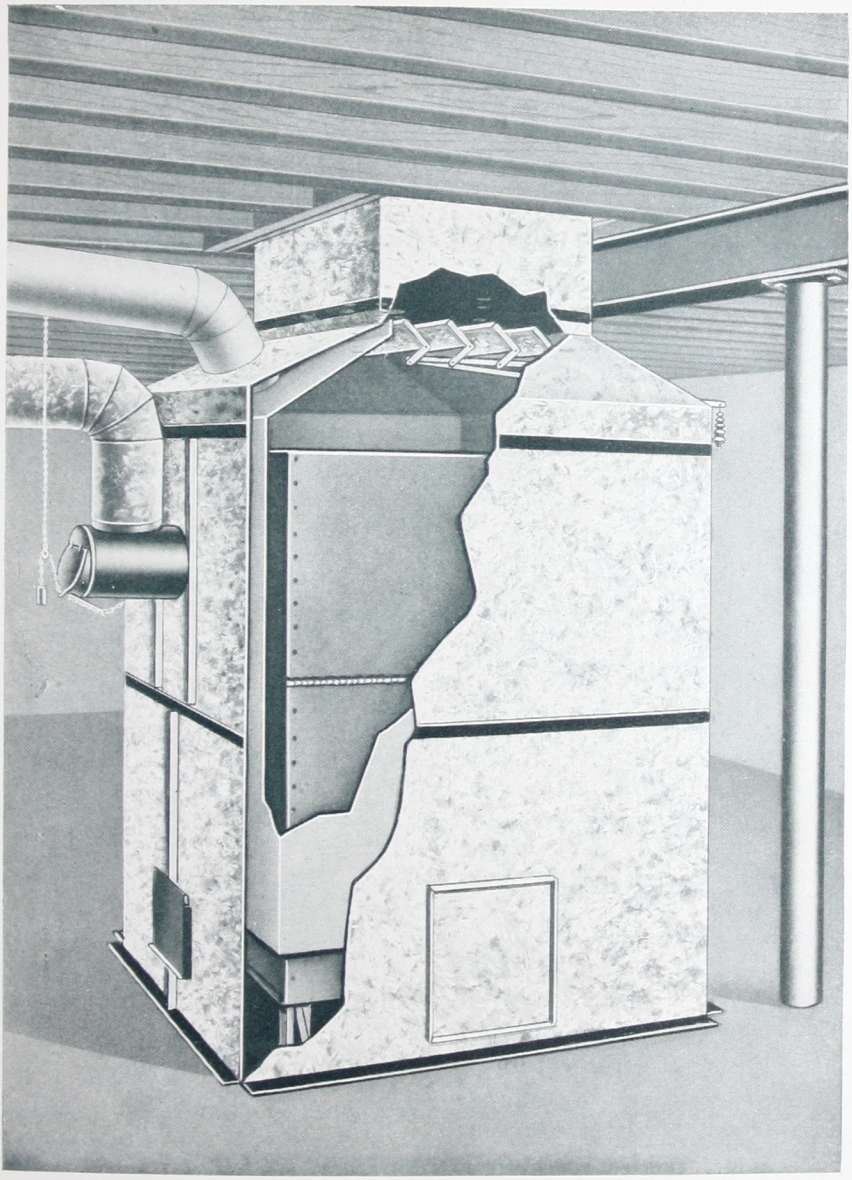
An additional pipe to heat a detached room, such as a bath room or kitchen, may be attached, if desired. It is necessary, in such case, to divert a part of the heated air from the center pipe. For this purpose we supply, as an extra, a set of valves by means of which the flow of air may be divided, a part of it supplying the separate smaller pipe, the bulk of it still passing upward through the large pipe and registers.

We do not recommend this extra pipe if the detached room is over 18 or 20 feet from the furnace, and for such rooms, and for very large detached rooms we recommend the use of hot water radiators, which can be very easily connected to a suitable water heater placed in the firebox.

With the pipeless, all of the air, the cool air at the floor (from the room having the larger register, and from the rooms connected by doorways to this room), is drawn into the heating chamber of the furnace, is heated and then driven back to the rooms. This constant process of removing the cold air and replacing it with the warmer air keeps all parts of the rooms at an even temperature, not possible with stove heat.

The installation of the HESS PIPELESS FURNACE is exceedingly easy, and it is especially adapted to old houses, and houses with limited cellar space. There is no tearing out of walls, no pipes to fit, and anyone who can set up a stove can set up this Pipeless furnace.

Nothing could be simpler: --- all that is required is to cut a single hole in the floor directly above where you have decided to place the furnace, set up the furnace and make connection from casing to register. Connecting the smoke pipe then completes the job and the house is ready for heat. This furnace can be installed in a cellar as low as five feet seven inches, the absence of horizontal pipes saving



The Hess Improved Pipeless Furnace showing deflecting valves — to divide the current of hot air—causing part to flow through the extra or smaller pipe.

headroom. The space used by stoves and the labor of setting them up and taking them down every year also are saved.

If there is no cellar under your house, a small space, sufficient to contain the furnace and a coal bin, can easily be prepared at slight expense.

The furnace comes in parts, all fitted, with bolts, etc., and there is no difficulty in putting them together. Mechanical skill or experience is not necessary. Any handy man or woman can install it.

The Pipeless method, however, has its limitations and is not adapted to all types of houses. The best results are obtained in houses where the rooms are connected by liberal size openings, rather than by ordinary doorways. The method has been over-rated by some advertisers and disappointment has often been the result. We recommend that sketches of the rooms be submitted to us before this method is adopted, so we may advise on the method best suited to the purpose.

THE HESS CIRCULATING ROOM HEATER

The Circulating Heater is of exactly the same construction as the Hess Welded Steel Pipe Furnace, except that instead of the lined galvanized casing, a dress of polished black steel is furnished, which may be kept presentable with little care, and the top is open, instead of having a cap for connection with hot air pipes. The sizes, dimensions, etc., are the same as those of pipe furnaces. (Page 35).

HEATS BY CIRCULATION

This heater warms by drawing the cold air from the floor of the room in which it stands, and discharging it rapidly upward when hot, thus moving and circulating all the air of the room. No registers nor ducts are required.

MAY STAND ANYWHERE

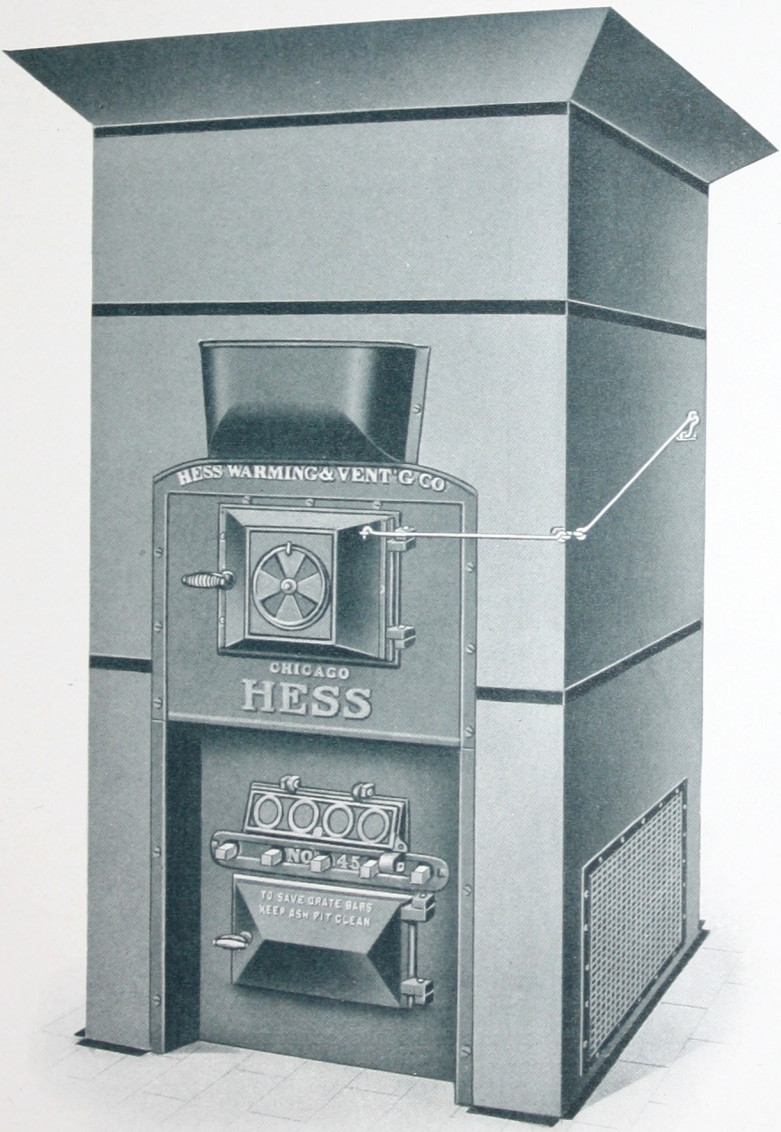
So rapid and powerful is its action that it may stand at any convenient point, out of the way, or even in a corner, and it will thoroughly and evenly warm all parts of the room, yet goods or persons near the heater are not overheated, as there is little warmth radiated from the sides of the heater, the heat being discharged in great volume from the top.

KEEPS FROST OFF WINDOWS

It is especially valuable for stores with show windows, as the circulated heat will keep such windows dry and free from frost, unless they are inclosed so as to prevent access of the warm air. The evaporation of water must be omitted, however, if dry windows are desired.

IDEAL FOR GARAGES

These heaters are especially suitable for garages because of the equal temperature produced throughout, and the absence of radiation from the sides of the heater. The heat will reach all parts of the room.



The Hess Circulating Room Heater.

MODERN FURNACE HEATING

JUST THE THING FOR SCHOOL ROOMS

This heater may be set off in a corner with fresh out door air admitted through the wall into the base of the heater. The smoke flue is inside of the ventilating flue, assisting the outgoing current of refuse air, and thus proper ventilation is provided. It meets all requirements of state laws; burns any fuel; is powerful and economical.

The desks may be within a few feet of the heater, for there is little heat radiated from the sides, yet the pupils at a distance will be just as warm as those near by. The floors are warmed, and the fresh pure air is evenly and thoroughly distributed. Ample humidity is added to the incoming air. When school is not in session, the outer cold air is shut off and the inner air circulated. The warmth of the room is thus maintained with little fuel. (See page 16).

HUMIDITY

The usual evaporating pan is supplied if desired, without charge; but if, as in the case of stores, it is desirable to keep frost off the windows, the evaporation of water should be omitted.

Compare the Hess Welded Steel Furnace with other methods;--- you will understand then, why Hess Furnaces are in demand in every state in the union, and why the demand every year has kept ahead of production.

HESS FURNACES VS. STOVES

The Hess furnace is in the cellar where all fuel and ashes are handled. No dirt upstairs; little labor required for attention to the heater. No space in living rooms spoiled for living purposes. The heat may be divided and distributed through various rooms, even with doors closed. The floors are warmed by the removal of the cold air, and the heat is perfectly circulated. The furnace is out of the way when not in use.

The stove takes up useful space in the living room, and all fuel must be carried in and ashes removed; more labor, plenty of dirt.

The heat is imperfectly distributed with doors open, not at all when they are closed.

Floors are cold and the lake of cold air upon them is undisturbed.

The stove must be removed when not in use, or remain, an unsightly obstruction, in the living room.

Stoves are not well adapted to the cheaper fuels although accompanied by excessive dirt and labor.

HESS FURNACE HEAT VS. RADIATOR HEAT, FROM STEAM OR HOT WATER

1. Hess furnace heat is MOIST heat. Four to eight gallons of water may be evaporated daily. The water is hot and evaporates rapidly into the rooms.

1. Radiator heat is dry heat. The steam or water is confined within the radiators but cannot escape and is never transmitted to the air of the rooms.

2. Hess furnace heat is CLEAN heat, no leakage of gas or smoke through the one-piece construction of the body of the furnace, inclosing fire box and ashpit, all seams riveted and welded, therefore, permanently sealed. The Hess furnace moves, rapidly, the entire atmosphere of the house, withdrawing the cold air and flooding the rooms with warm air. The floors are warmed and the heat penetrates to every corner.

2. Radiator heat is not as clean as Hess furnace heat. The radiators gather dirt and dust, requiring much labor to be kept clean. Walls back of radiators are soiled and discolored. Leaky connections often ruin floors and ceilings. Radiators take up valuable space in the rooms. Radiator heat circulates slowly; the cold air at the floors is not disturbed. Thermometers at floor and ceiling will show as much as 15 degrees difference in temperature.

MODERN FURNACE HEATING

3. Hess furnace humid heat is not injurious to woodwork, furniture, pianos, etc., nor to health. You can sit next to a register without discomfort. A piano may be placed within a foot of a register without injury.	3. Because of the lack of moisture and the direct heat from radiators, woodwork, pianos, furniture, etc., are over-dried, cracked and damaged. If your furniture is damaged, surely health may be impaired.
4. Hess furnace heat is direct circulated heat and is quicker than steam or water heat. Hess Welded Steel furnaces heat the air instantly the fire starts and much quicker than steam or water. A hot air register is not a heater, but merely an outlet through which the warm air passes to fill the room, expelling colder air near the floor, which is returned to the furnace and heated.	4. Radiator heat is slow. Instead of promptly heating and circulating the air, the fire must first heat the water or raise steam. Then the radiators are heated by absorbing the heat of the water or steam, which then radiates to the air of the rooms. Why heat barrels of water before heating the air of your rooms, which is the real purpose of any heating plant?
5. The Hess furnace is adaptable to changeable weather. For chilly days a small fire instantly gives the required heat. For cold weather a heavier fire may be maintained with no more attention than with steam or water heat. In many sections, especially near the Great Lakes, the weather varies constantly, cold one day, warm the next. The requirements of such climates are much better met with direct and quick Hess furnace heat than with slow and indirect steam or water heat.	5. On chilly days when only a little heat is required, the time and fuel necessary to raise steam or heat water are the same as in cold weather. The result is overheating and waste of fuel in mild weather. In severe weather the steam or water plant cannot be forced, as a furnace may be. With weather and temperatures that vary constantly, steam or water heat is not flexible and adaptable like Hess furnace heat.
6. Hess Welded Steel furnaces heat evenly. The heat is easily regulated and distributed. When necessary, extra heat may be diverted to rooms requiring it; not possible with other methods.	6. Many believe that steam or water heat is more even than furnace heat. This does not apply in the case of correct installation and management of furnaces. With any system of heating, certain rooms exposed to strong winds are slow to heat. No regulation, with steam or hot water, will overcome this. The maximum of radiation must be supplied, too much for ordinary conditions, therefore unnecessarily expensive.
7. The registers with a Hess furnace use only a fraction of the valuable space taken by steam or water radiators and are placed toward the center of the building; not conspicuous nor obstructive.	7. Radiators are unsightly — dirty and obstructions in any house, requiring space near walls and windows preferred for other purposes.
8. Hess furnaces may safely be left without fire in zero weather. No water to freeze.	8. Hot water and steam systems must be drained if left without fire in cold weather, to avoid freezing and bursting of pipes.
9. Hess Welded Steel furnaces have a much lower maintenance cost than steam or water heaters. Repairs and replacements of parts are inexpensive, and new parts may be placed without dismantling the heater nor disturbing the pipes, and do not require skilled or expensive labor. Any handy man can make the changes required.	9. With steam or water heat repairs and replacements call for an expert mechanic and a greater charge for materials. Leakage—freezing and danger of explosions incidental to boiler heating are impossible with Hess Furnaces.

10. A Hess furnace equipment may be installed for less than half the cost of steam or water. Any handy man can install a Hess furnace equipment by following our complete directions and plans.	10. Besides the much greater cost of equipment and materials, the cost of installing a steam or water plant is several times greater than with a Hess furnace, and the services of an expert are necessary.
11. Anyone can operate a Hess furnace. It is simple as a stove. Automatic regulation may be used if desired. While convenient, it is in no way necessary to success.	11. A steam plant requires more than casual knowledge and is not safe in the hands of a novice.
12. A Hess furnace will do all and more for you than steam or water heat. Do not think of a Hess furnace as an ORDINARY furnace. It is different and better in every way.	12. Because steam and water heat cost more than a Hess furnace is no reason for superiority. People of all classes and degrees of wealth are using Hess furnaces, many of whom would consider the cost of a steam or water no bar if any advantage might be secured.

THE HESS WELDED STEEL FURNACE VS. THE ORDINARY FURNACE

1. Different and improved c-nstruction of the Hess Furnace with best results in heating. The present style was adopted 25 years ago and improvements have been added from time to time.	1. Ordinary furnaces offered today do not show improved construction, efficiency and progression that many other manufactured articles do. Automobiles of early types are a joke, when compared with present models, yet the ordinary furnace has but little to commend it over the first furnace of seventy-five years ago, and is little changed in design;—in some cases not at all.
2. The square shape af the Hess Furnace is superior because it permits the greatest amount of heating surface, and more convenient and more efficient fire-box.	2. Most makers stick to the round shape because it is easier and cheaper to make cast iron furnaces round than square, and because they have always been made round. Some men are democrats because their ancestors were democrats.
3. The weight of the Hess furnace is distributed evenly over great radiating surface, due to the square shape and flat sides. The heat, not concentrated, does not over-heat the metal.	3. Less direct radiating surface due to round shape. Compare a cylinder to a cube. Its exposed area is much less, for the same diameter. The heat is, therefore, more concentrated, less rapidly radiated, and more destructive of the parts.
4. Steel in the Hess Furnace heats up quicker and radiates faster than cast iron and warms the rooms quicker. Any furnace man will admit this.	4. Slow to distribute heat on account of heavy lumped weight of cast iron sections and of small heating surface.
5. The Hess Welded Steel Furnace weighs approximately the same as the average cast iron furnace of the same size firepot. It is not a lightweight furnace, though the weight is distributed over a greater area of direct heating surface than is the case with a round cast iron furnace.	5. Mere weight is no index of power. The exposed area of radiating surface is what counts for economy and efficiency. Cast iron furnaces have smaller radiating surfaces than the Hess.
6. Main inner body, or radiator, of	6. Main inner body, six sections or

the Hess furnace is like one piece of continuous metal, all seams are double, and riveted and then sealed by melting the steel till the plates are one. No seams can possibly open. Permanently gas and smoke tight.	more, with cemented or sanded cracks between, which open from expansion with heat, allow leakage of gas, dust, and smoke, to the rooms. No practical method yet devised for permanently welding or joining cast iron sections or cast iron and steel sections. No cast iron or sectional furnace can be permanently gas and smoke tight.
7. Fire-box in the Hess Furnace is close to the fire door, convenient for firing and regulation.	7. Firepot in center, inaccessible and with often a tunnel arrangement to admit fuel into firepot. Very inconvenient.
8. Square shape and vertical sides of firebox in the Hess Furnace allow even depth of fire. Grate surface under the entire fire. A deep and most efficient fire, with even combustion throughout.	8. Round firepot invariably of greater diameter at top than at the bottom, tapering down to the grate surface. Grate surface not under entire fire, and uneven combustion results. Lack of sufficient air causes clinkers.
9. The Hess Furnace has heavy fire brick lining to hold fire and protect the steel. Brick will stand far greater heat than cast iron, are thicker and will hold heat longer. Brick will last as long as average cast iron pot and can be replaced at a fraction of the cost of the iron pot and with little labor.	9. Cast iron firepot is easily warped and ruined from overheating. It may have a very short or long life but its average is no longer than fire-brick. Replacing of iron pot requires dismantling and rebuilding the furnace, at considerable expense.
10. Grate bars in Hess Furnace are small units, independent and easy to shake and they clean the fire perfectly. Small expense to replace.	10. Grates are in large units hard to shake, impossible to get clinkers out without dumping fire or with poker. Grate arrangement often complicated, interlocking, or one grate depending for action on the next. Expensive and difficult to replace.
11. One clean out place only, in the Hess Furnace with straight smooth sides and bottom. Anyone can clean the Hess furnace in a few minutes. No flues nor inner passages.	11. Many furnaces have inaccessible flues, tubes or corrugations to be cleaned, requiring considerable labor and care, not required in cleaning the Hess furnace.
12. Smoke outlet in the Hess Furnace is at the bottom of a large settling chamber which lets out the smoke; holds back the heat. Simple draft arrangement. Direct draft opens automatically when fire door is open, to prevent smoke puffing out into basement. Hess Furnaces for 1925 have chain-operated check draft; regulates perfectly—prevents waste of heat to chimney.	12. The ordinary draft arrangement is wasteful, smoke and gas carried directly upward from the top of fire and excessive heat with it. Often the smoke is carried through circular flues around the firepot. Such flues foul quickly and need constant cleaning.
13. A double air chamber enclosing	13. Ordinary furnaces are hot on

THE ORDINARY FURNACE

Not from any particular maker, but a **type,** produced with slight modifications, by many foundries.

Rough castings,—piled up with sand or cement to fill the cracks.

Just the common, ordinary, cast iron furnace, sure to leak gas and dust. It established the reputation that furnaces are dusty and dirty, and **"lives up to it."**

THE HESS WELDED STEEL FURNACE

Immense radiating surface, evenly heated, but never over-heated, the firebox being lined with heavy fire brick.

Seams welded and riveted; everlastingly proof against leakage, and fully guaranteed.

inner body of Hess furnace prevents loss of heat in basement, speeds up circulation and is better than coverings over furnace, which merely absorb heat.

14. Air chamber in Hess Furnace on sides is not only double but of ample, uniform area from top to bottom. The inner body of Hess Furnace is on legs with a large space under it. The air circulates around and under and up on all sides of the inner body. This makes the most efficient circulation possible.

15. Ample humidity in Hess Furnace is provided by moisture pan properly located ABOVE the fire level, so the water is always hot. Four to eight gallons of water evaporated daily.

16. The Hess Furnace is suited for any fuel and offers an opportunity to save money by using cheap fuel. Will give clean heat from soft coal and not injured by soft coal or coke. Best for oil—ask any oil burner maker.

17. The Hess Furnace has few parts and simple construction. Nothing complicated to get out of order or need replacement. Every real advantage any furnace has without ordinary disadvantages.

18. The Hess Furnace has a long life. Steel in flat shape will not rust readily. The steel used in Hess furnaces before 1912 was half the thickness of that used now, yet many of these lighter furnaces are still in use, after many years of service.

19. Low replacement cost of all parts. Contrary to general practice the combined price of all parts of a Hess furnace, part for part, is but little more than the price of the complete furnace. Our brick fire lining sells at about 1/5 of the price of a cast iron pot of

the outside from top to bottom, like a stove, and waste heat in the basement. This waste is due to the use of a single air chamber which permits heating of the outer casing.

14. Air chambers of common furnaces are restricted or obstructed on the sides due to varying diameters of the round sections, which prevent the air chamber from being uniformly large. The inner bodies rest close to the floor and have no space for circulation underneath.

15. Ordinary furnaces have inadequate provision for evaporation, the water pan often too small and improperly placed at the bottom of the furnace, where the water remains cool. The water must be steaming hot to evaporate rapidly. Ordinary furnace heat is dry heat.

16. The ordinary furnace will BURN any fuel BUT the results are often disastrous; gas and smoke leak through between the joints of cast iron firepots, the smoke passages soon foul and clog, losing their efficiency. Cast iron warps and twists with heat, soon losing its original shape.

17. Ordinary furnaces are more or less complicated. There are cemented joints to be recemented, costly firepots to be replaced, etc.

18. Ordinary cast furnaces may have a long or a short life. Their average life is less than that of Hess furnaces. Cast furnaces cannot resist abuse like the Hess and are frequently ruined from overheating, and use of fuel not suitable. ANY FUEL is suitable for a Hess.

19. Many auto owners have learned to their distress that prices of parts are out of proportion to the price of their auto. So with ordinary furnaces; the combined price of all parts is several times the price of the original furnace. A fair selling price for all parts should

equal size. The entire steel inner body or radiator sells for less than the average cast iron pot. Grates are sold at about half the price of ordinary grates. So on, for all parts.

approximate the price of the complete article. Why pay more?

20. We sell Hess Furnaces and complete equipments delivered or installed, within 40 miles of Chicago or our branches in Brooklyn, Detroit, Cincinnati, Minneapolis or Milwaukee, or freight prepaid to your station, anywhere, with a binding guarantee of satisfaction. If you want your local dealer to handle it, we lend him every assistance by planning the arrangement and advising him in the matter. When installed according to our plans, we guarantee results the same as if you bought direct. We lay out the work and furnish free plans when requested. We sell direct or through your dealer, as you prefer.

20. Most furnaces are sold through dealers or middlemen, the maker not assuming any responsibility. Not fair to you, for the maker should be consulted as to the best arrangement, should assist in securing good results, and when consulted should guarantee success.

To prove this is a real and fair comparison with any furnace, investigate results by consulting our customers. A list of the users in your locality is supplied on request.

We make and carry on hand a large line of **Furnace Supplies,** including registers, iron, tin and galvanized pipes and fittings, cement and all things used in furnace installation. These are described in a separate folder, sent free on request.

Send us a sketch of your house and we will make a plan and material list showing every detail of fittings needed, with estimate of cost for the whole outfit, delivered at your station, freight prepaid.

With ample capital and facilities unequaled, buying all supplies at the mill in large lots, for spot cash, and not a member of any trust or combination, we are in a position to offer our customers the very best service at a minimum price.

We make a specialty of supplying complete heating equipments for buildings of all kinds, with registers and pipes all made to measure and fitted, ready to put up, and we ship these equipments from our factory straight to buyers all over the United States and Canada. We plan the arrangement of every job and submit our plan for the owner's approval before the work is made. We prepare every detail, and on such equipments we pay freight to destination. Distance is no bar. We ship everywhere. We have customers in Maine and in Alaska, in Florida and in California, and in Japan, Korea, China and Russia.

MODERN FURNACE HEATING

We fully instruct the buyer, so he can set up the apparatus. With each equipment, we supply a drawing to a scale, and material list showing every pipe, register, air supply, etc. We also send an illustrated printed book of directions showing how all parts of the furnace will go together. We will also loan tools, without charge, if the customer is not supplied. Our equipments are so planned and prepared that any handy man who can set up a stove and connect the smoke pipe can set up our furnace and connect it, by following our simple directions. And when the heater is set up we guarantee its success. Not this only, but we allow free trial before the money is paid us. Could we offer such terms if the quality of our goods was doubtful?

At first thought the setting up of a furnace equipment may seem difficult. It is not. We have shipped thousands of these outfits to every state in past years, and our customers repeatedly tell us of the ease with which the work is fitted up. It is not necessary to tear up the house to get our system installed. It is usually put in without breaking plaster, even in old houses.

The following tools will facilitate the erection of our heating outfit: hammer, small monkey wrench, screw-driver, reamer, drift pin (a large nail will answer), marking compass, straight and curved snips, cold chisel.

We will supply any of these tools at cost, or will loan them free when shipping equipments, to be returned to us by express, prepaid, after the apparatus is erected.

For cutting floors, a brace and bit, compass saw and wood chisel will be needed.

The best proof of the advantage to the buyer in this plan is the fact that orders are often duplicated, our customers recommending our plan and our goods to their friends. Our books show that forty per cent. of our new business originates in the recommendations of our customers; and the increase in our business has been such that we have been compelled to increase our facilities considerably from time to time.

Our factory is fitted with the most approved and modern styles of labor-saving machinery, electrically driven, enabling us not only to reduce our costs to the lowest possible point, but to do the best work possible.

MODERN FURNACE HEATING

Our plan saves money for the buyer, and it insures success in heating. Our experience in planning the arrangement of the apparatus, and our guarantee, with free trial, completely protect the purchaser from errors and inconveniences.

YOU CAN BUY DIRECT FROM US—OR THROUGH YOUR LOCAL DEALER

We have all respect for local dealers and their claims on local patronage, and if customers desire to purchase through them, we are glad, and will render every possible service to insure success. We do not hold ourselves responsible, however, for the success of a furnace placed by a dealer, unless the plan of the house to be heated is first submitted to us, with the arrangement of pipes, registers, etc., fully indicated and approved by us, and the work installed according to these plans. We prefer, in every case, that a sketch showing the size and arrangement of the rooms be submitted to us so that we may plan the arrangement of the pipes and registers and recommend the size furnace to be used, its position, etc. We make absolutely no charge for this service, but consider it a privilege to be permitted to plan the work, and when we have so planned it our guarantee applies, and we will be responsible for the success of the heater whether purchased direct or through a dealer.

When we deal in this manner, or direct with contractors and consumers, we know exactly what is expected of us, and we can direct how the work should be placed to insure success. Every day plans are submitted to us which embody mistakes that would be fatal if carried out. Some buyers would accept such plans through ignorance or a desire to avoid discussion, and then there would be trouble.

With this booklet is enclosed a sheet indicating the information we require in order that we may prepare a plan and estimate for heating your house. If you will supply us with this information we will take pleasure in forwarding our plan and estimate promptly.

We charge nothing for plan, estimate and information, even if you buy from others.

We are glad to have your consideration if you contemplate the purchase of a furnace, and by this careful showing of our method we feel sure we can make your consideration favorable to us.

OUR USUAL TERMS

are cash with the order or on receipt of goods. We prepare the shipment, with all details fitted and marked. To the bill of lading we attach sight draft for the agreed price, through your local bank or express agent.

This is payable upon arrival of the goods, and the privilege of examination before payment is allowed. If any parts arrive in damaged condition, we immediately forward new parts to replace them free, and then we file claim with the railroad for the damage, so you are not delayed nor put to expense by reason of such damage.

OUR INSTALLMENT PLAN

To buyers holding recorded title to the building to be heated, who may desire to buy on time, we frequently sell our equipment on monthly installments, receiving one fifth with the order, the balance in 10 equal monthly payments. In all cases where the terms provide for time payments, we require notes, signed by the purchaser and his wife, if married, and by the owner of the building if the purchaser is not the owner, and these notes bear interest at six per cent. per annum till paid, the last payment to be made within one year. Two satisfactory references are required, and a legal description of the premises where the furnace is to go, with the name of the owner holding title properly recorded. All accounts are payable in Chicago funds.

By this plan, a customer with small income may secure the Hess Furnace on very easy terms.

WE SELL ON TRIAL

allowing two winter months for test.

When furnaces are sold on trial we make sight draft, payable on arrival of the goods, which is collected by the local bank or express agent. The money is held by the bank making the collection, for the time stipulated, until the furnace is set up and tested. If it proves as represented by us, the money is remitted. If not, the money is held until we have made our representations good, or, failing in this, the goods may be returned at our expense and the price refunded to the purchaser. No matter when you buy, even if at the end of winter the money is held till cold weather comes again and you have the benefit of two months of cold weather, for trial. **Your own banker,** whom you know and trust, may hold the money.

No better evidence of the high character of our goods could be asked. We have sold furnaces under this trial plan for many years, and but four out of thousands of furnaces shipped have ever been rejected and returned. There have been a few cases where mistakes have been made, which could not be satisfactorily adjusted by mail,

and in each case we have sent an expert from Chicago at our own expense, who has corrected the trouble and made everything satisfactory to our customers. If our heaters were not sure to be satisfactory it would be suicidal for us to make such terms.

To cash buyers who pay in full, promptly, we allow a liberal cash discount from our regular prices.

MODERN FURNACE HEATING

DIMENSIONS OF THE PIPE FURNACE

Number of furnace	41	46	51	56	58	60
Width of furnace, inches	38	38	38	38	44	44
Depth of furnace, inches	36	41	47	55	73½	93½
Height, high cap, inches	73	73	73	73	73	73
Height, low cap, inches	65	65	65	65	65	65
Width of steel radiator	26	26	26	26	30	30
Depth of steel radiator	28	34	40	48	66	85⅝
Height of steel radiator	51½	51½	51½	51½	51½	51½
Shipping weight, lbs.	900	970	1070	1165	1858	2260
* SQUARE FEET OF RADIATING SURFACE	49	57	61	70	127	185
Width of door necessary for radiator to pass, inches	28½	28½	28½	28½	30½	30½
* AREA of GRATE and FIRE SURFACE, square inches	295	357	441	504	580	840
Equalling a round pot, inches in diameter	22	24	27	29	31	35
Width of fire-box, inches	21	21	21	21	20½	20½
Length of fire-box, inches	14	17	21	24	32	41
Height of fire-box, inches	18½	18½	18½	18½	21	21
Width of fire-door, inches	13⅜	13⅜	13⅜	13⅜	17¾	17¾
Height of fire-door, inches	9¾	9¾	9¾	9¾	9¾	9¾
Diameter of smoke pipe, inches	8	8	8	8	10	10
Capacity, number of rooms in dwelling	5 to 8	6 to 9	7 to 11	9 to 12	12 to 15	14 to 20

THE PIPELESS FURNACE

All dimensions are the same as the Pipe Furnace, except the following

Number of furnace	41	46	51	56
Width of furnace, inches	50	50	50	50
Depth of furnace, inches	36	41	47	55
Height to bottom of square register pipe, inches	67	67	67	67
Capacity, in thousands of cubic feet of space	12 to 15	15 to 18	18 to 20	20 to 25
Size of combination register face opening, inches	28 x 28	30 x 30	27 x 38	27 x 38
Size of floor opening to admit face, inches	28½ x 28½	30½ x 30½	27¾ x 38¾	27¾ x 38¾
Shipping weight, lbs.	1090	1150	1325	1500

* The area of fire-surface and of radiating surface indicates the power of your furnace. Compare our area with those of other furnaces offered at the same price, and note how much more we are supplying.

Style "E" To recess

HESS

Snow White Steel Medicine Cabinets and Mirrors

Ask for our free booklet showing various styles of cabinets and mirrors.

They supersede wood for bath rooms in the home, and in hotels and apartment buildings. Made of smooth, annealed steel, heavily coated with white enamel, each coat baked separately. Best polished plate glass mirrors, nickel plated brass hardware, white steel or plate glass shelves. Good enough for the finest bath room — low enough in price for the economical builder — guaranteed never to sag nor warp — the enamel never to crack nor peel. Sanitary, clean, durable.

Style "F" To recess

Style "H" To hang on wall